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OBSERVATIONS ON THE COCCIDAE OF FORMOSA PART IV

ALEYRODIDAE OF FORMOSA PART III

BY

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OBSERVATIONS ON THE COCCIDAE OF FORMOSA. IV.

By

Ryoichi TAKAHASHI

Introduction.

The present paper is essentially like its predecessors, the last number of which was published in the Report No. 60 of our Department.

The species dealt with in the following pages attack for the most part various cultivated plants and useful wild trees in Formosa, and among them the more important species from an economic standpoint are *Eumyrmococcus smithi* Silvestri on sugar cane, *Diaspis boisduvali* Signoret on orchid, *Parlatoria mytilaspiformis* Green on tea, *Poliaspis pini* Maskell on pine, *Fiorinia horii* Kuwana on Rhododendron, and *Pseudischnaspis anassarum* Lindinger on pineapple. It is noteworthy that *Parlatoria proteus* Curtis has been recently found in abundance for the first time on mango and *Phenacoccus hirsutus* Green on cotton, while *Pseudococcus lilacinus* Cockerell on coffee, in the southern part of our island.

The species now known to occur in Formosa total more than 230, of which some 25 remain unrecorded in our collection, being represented by inadequate specimens; and a number of additional species will be found by more field work especially in the mountainous regions. The results of my further observations will be set forth later.

The type specimens are preserved in the Entomological Laboratory, Department of Agriculture, Government Research Institute, Formosa.

I express here my thanks to Prof. T. SHIRAKI and Mr. E. E. GREEN for their valuable help in various ways. I am also indebted to Messrs. J. SONAN, S. OSHIMA, K. SAKIMURA, and M. YANAGIHARA who have put their collections in my hand for study. Lastly I deeply lament the sudden death of Dr. I. KUWANA who, as is well known, devoted much of his life and energy to the study of the Coccidae of Japan.

New or little-known Formosan Coccidae.

Kuwania quercus KUWANA.

FERNALD, Cat. Cocc. World, p. 32 (1903); KUWANA, Nippan Kaigara-mushi Zusetsu, II, p. 134 (1917); FERRIS, Can. Ent., XLIX, p. 377 (1917) and LI, p. 111 (1919); MORRISON, U. S. Dept. Agr., Tech. Bull. No. 52, p. 65 (1928).

Hosts.—Quercus glauca, Quercus sp., attacking the stem and branch.

Hab.—Taihoku.

Observed in abundance in the Botanic Garden at Taihoku in April, 1933; and in the last week of that month only the dead females and eggs were found. The Formosan specimens well agree with the descriptions and figures by KUWANA, FERRIS and MORRISON. Hitherto unrecorded from Formosa.

Eumyrmococcus smithi SILVESTRI.

Boll. Lab. Zool. gen. agr. R. Scuola sup. Agr. Portici, XVIII, p. 273 (1926).

Hosts.—Saccharum officinarum, Imperata sp., attacking the root.

Hab.—Taichu.

Collected by Mr. M. YANAGIHARA on Feb. 24, 1933. Previously known from China and Japan, and a coccid which seems to be closely related to this species was recorded from Sumatra by Dr. W. ROEPKE (Miscel. Zool. Sumatra. 1930, XLV). This species is associated with the ant, *Rhizomyrmo sauteri* Forel, the winged females and workers of which carry the coccid, holding it in the mouth.

Pseudococcus shintenensis n. sp.

(Adult female) Purplish brown, covered with a powder. Body elongate, narrow, nearly parallel on the sides, about 2.5 times as long as wide in mounted specimens. Antennae 8-jointed, with long bristles; the 1st joint wider than long, but all the remaining joints longer than wide; the 2nd about 1.5 times as long as wide, with a small sensorium at the tip; the 4th—7th a little narrowed towards the base: the 7th with a stouter bristle near the tip; the 8th longest, about 3.5 times as long as wide, with 3 stouter bristles; the relative length of joints about as follows: I—12, II—12, III—10, IV—7, V—10, VI—8, VII—9, VIII—22. Eyes normal, marginal. Mouth parts rather small, with the loop very short; labium not segmented, slightly longer than wide, tapering, more or less pointed apically, with some long bristles on the distal part. Spiracles much constricted about the middle,

widest at the base, wanting pores, but with some indistinct areolations on the basal part, the posterior ones larger. Legs with long bristles, and 2 usual pores on the trochanter; hind coxae as long as or a little longer than wide, with over 12 small circular pores in groups at the basal margin; femora scarcely swollen, hind femora about 3.6 times as long as wide; hind tibiae as long as the femora, not swollen, a little over twice as long as the tarsi, lacking pores; tarsi with 2 very long capitate setae near the tip; claws without teeth. Anterior and posterior ostioles on the dorsum distinct, normal. Ventral cicatrix transversely oval, irregular on the margin, moderate in size. Anal ring chitinized on the margin, with many small pores nearly in 2 rows except on the anterior and posterior ends; the pores nearly equal in size; some very minute pores present on the marginal chitinized area of the anterior part; anal setae 6 in number, long, stout, as long as or somewhat shorter than the apical setae, much longer than the diameter of the ring. Apical setae on the basal part as stout as the anal ones; a narrow chitinized part running from the base of each apical seta. 32 cerarii present along the whole margin, of which 2 are on the front between the antennae; the last cerarii very large, somewhat larger than the anal ring, somewhat protruding, well defined, chitinized nearly over the whole surface, with numerous triangular pores in a loose cluster over the whole surface, about 15 bristles, and 2 spines which are conical, rather slender, sharply pointed, rather large, and much larger than other cerarian spines; the penultimate cerarii small, not defined, not protruding, somewhat chitinized, with about 13 triangular pores, 3 accessory bristles, and 2 spines which are similar in shape to the last cerarian ones, but much smaller; frontal cerarii not protruding, not chitinized, with some 8 triangular pores and 4 similar spines; other cerarii not or slightly chitinized, not protruding, with some 2-6 triangular pores, 0—2 accessory setae, and 2 similar but a little shorter spines. Minute triangular pores numerous, present on the whole surface. Larger circular pores present only on the venter, numerous around the genital opening and in a transverse group anterior to the genital group, and some also in 2 transverse rows in front of the above mentioned group. Many very small short ducts present on the posterior half of abdomen. Many bristles also present on the body, those on the head especially on the venter much longer, as long as the hind tarsi.

Length of body—about 3.0 mm., antenna—about 0.44 mm., hind femur—about 0.25 mm., hind tibia—about 0.267 mm., hind tarsus—about 0.115 mm., last cerarian spine—about 0.028 mm., frontal cerarian spine—about 0.0185 mm., penultimate cerarian spine—about 0.019 mm., apical seta—about 0.184 mm., width of ventral cicatrix—about 0.09 mm., diameter of last cerarus—about 0.1 mm.

Host.—A plant of the Gramineae.

Hab.—Shinten near Taihoku.

Collected by me on April 2, 1933. This species is characterized by the very large chitinized last cerarii and by the presence of pores on the basal margins of hind coxae. On the same host plant at Shinten a new species of *Trionymus* resembling *T. pulverarius* NEWST. was also found, which will be described when more material is obtained.

Asterolecanium japonicum COCKERELL.

Psyche, IX, p. 71 (1900); FERNALD, Cat. Cocc. World, p. 54 (1903); KUWANA, Nippon Kaigara-mushi Zusetsu, II, p. 84 (1917).

Hosts.—Lithocarpus spp., attacking the leaf.

Hab.—Suisha.

Very abundant near Suisha, but has not been recorded from Formosa. The adult female has some small groups of dorsal paired-pores smaller than the marginal ones on the submarginal area, which are sometimes wanting; the spiracles are connected with the margin by a series of minute simple pores which are continued along the marginal row of paired-pores only for a short distance in both directions; the caudal lobes are not developed, with no cleft; the anal ring is not discernible; the caudal setae are moderately developed and a pair of minute setae is present between them; no chitinized plate is present at the hind end.

As the descriptions of the Japanese species of the genus on the Fagaceae are very brief and I have no Japanese specimens for comparison, this identification is not certain. In Formosa another 2 species of *Asterolecanium* not yet recorded are found on *Lithocarpus* and other trees of the Fagaceae, which will be dealt with when the Japanese specimens are available for comparison. *Asterolecanium tokyonis* KUWANA also attacking the Fagaceae, however, has not been discovered in Formosa.

Aulacaspis greeni n. sp.

Aulacaspis cinnamomi, TAKAHASHI (nec. Newstead), Jl. Soc. Trop. Agr. Formosa, III, No. 4, p. 377 (1931); Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 60, p. 59 (1933).

(Adult female) (Scale) Circular, slightly convex dorsally, white, not transparent, about 2.0 mm. in diameter. Larval skins pale brown, longitudinally black on the median area, small, near the center; the 1st skin extending beyond the front of the 2nd, but far separated from the margin of scale.

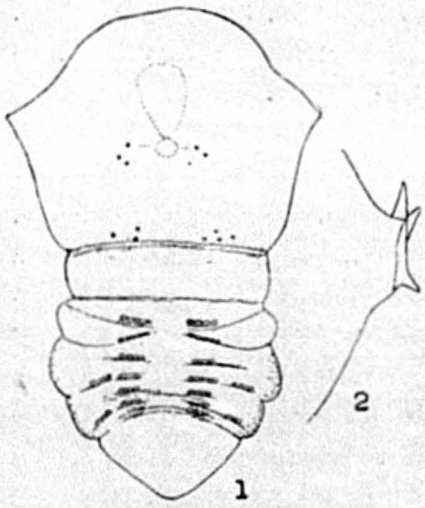


Fig. 1.
Aulacaspis greeni n. sp.
(Adult female)
(1) Body.
(2) Distal part of thoracic tubercle.

(Body) Cephalothorax very large, wider than the abdomen, much wider than long, eminently protruding on the side, with about 2–4 small pointed spines on the apex of the protruding part; about 2–6 small dorsal gland orifices present above the anterior spiracle; some 4–12 similar ones scattered near the hind margin. Antennae with a long seta curved. Anterior spiracles with about 15–20 parastigmatic pores, posterior spracles with about 9 or fewer pores. Abdominal segments convex laterally, with transverse rows of gland orifices; last 2 segments (anterior to the pygidium) with many lateral glands smaller than those on the pygidium and some slender lateral gland spines shorter than those on the pygidium; the preceding segment with about 3 lateral glands smaller. Length of body—about 1.0 mm.

(Pygidium) Much wider than long, with many lines on the dorsum. Anal opening somewhat nearer to the base than to the apex. Dorsal gland orifices about 9–15 on each side, arranged in 3 rows. Marginal glands 7 on each side, longer than the dorsal ones. Median lobes in a distinct incision, rounded apically, a little serrate, diverging; the 2nd lobes eminent, divided, rounded apically; the 3rd lobes

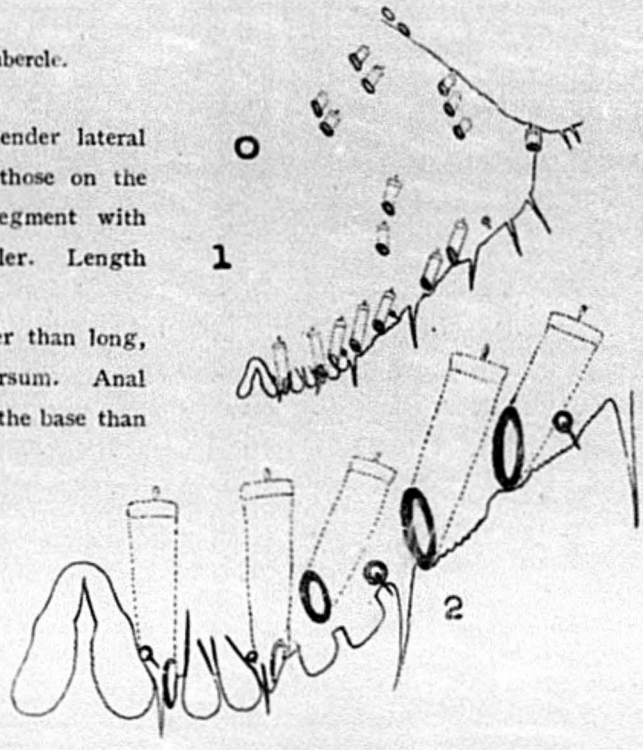


Fig. 2.
Aulacaspis greeni n. sp.
(Adult female)
(1) Pygidium. (2) Margin of pygidium.

distinct, wide, divided (see the figure). Gland spines long, 7 or 8 on each side. Circumgenital pores in 5 groups; the median group with about 9–15 pores, the upper lateral with about 17–25, the lower lateral with 14–17.

Host.—Cinnamomum reticulatum.

Hab.—Garambi, Kankau, Kuraru.

Very common in the southern extremity of Formosa, but not found elsewhere. Formerly recorded as *Aulacaspis cinnamomi* NEWST., but differs in possessing a prominent spinose protuberance on each side of the cephalothorax, and in the presence of transverse series of dorsal pores on all the abdominal segments, instead of on the terminal segments only. The species approaches *Aulacaspis fulleri* COCKERELL and *A. spinosa* MASKELL in the number and disposition of the dorsal pores, but those species have no spinose tubercle on the thorax. The differences are so distinct that I think there is full justification for describing it as a new species. Dedicated to Mr. E. E. GREEN who has kindly and generously given valuable help to my study.

In spite of careful investigation at Kuraru, Kankau and Garambi of possible food plants of this species, including various trees of the Lauraceae, it was not found on any plant other than *Cinnamomum reticulatum* which is distributed only in the southern extremity of our island.

Diaspis boisduvalii SIGNORET.

FERNALD, Cat. Cocc. World, p. 228 (1903); HERRICK, Mississippi Agr. Expt. St., Tech. Bull., No. 2, p. 36 (1911); LINDINGER, Die Schildl., p. 75 (1912); DIETZ and MORRISON, Cocc. Indiana, p. 287 (1916); COMSTOCK, Cornell Univ. Agr. Expt. St., N. Y. St. Coll. Agr., Bull. No. 372, p. 547 (1916); BRAIN, Bull. Ent. Res., IX, p. 223 (1918–19); LEONARDI, Mon. Cocc. Italiane, p. 186 (1920); KUWANA, Dept. Finance, Imp. Plant Quar. Service, Tech. Bull. No. 4, p. 15 (1926).

Host.—Rhynchostylus retusa.

Hab.—Taihoku.

A few specimens were found on the cultivated orchid in May 1933 by me. New to the fauna of Formosa.

Diaspis manni GREEN.

Chionaspis manni, GREEN, Mem. Dept. Agr. India, Ent. Ser. I, No. 5, p. 344 (1906).

Phenacaspis manni, TAKAHASHI, Dept. Agr., Gov't. Res. Inst. Formosa, Rept. No. 48, p. 37 (1930).

Diaspis gordoniae, TAKAHASHI, Bull. Ent. Res., XXII, p. 211 (1931); Dept. Agr., Gov't. Res. Inst. Formosa, Rept. 60, p. 60 (1933).

Hosts.—Gordonia anomala, Lithocarpus sp., Diospyros discolor.

Hab.—Taihoku, Kahodai near Hassenzan, Suisha, Kurard.

The scales of the adult females of this species are very variable in shape and I have recorded the species under different names. The pygidium of the adult female is similar to *Diaspis* and the scales collected on *Gordonia* and *Lithocarpus* are nearly circular, and I place the coccid in *Diaspis*. *Diaspis gordoniae* TAKAH. sinks as a synonym, the dorsal gland orifices on the pygidium of which are arranged mostly in 2 rows, though the lateral row is not indicated in my figure (Bull. Ent. Res., XXII, p. 211).

Phenacaspis formosana n. sp.

(Adult female) (Scale) White, thin, semitransparent, oval or nearly circular, very slightly convex, about 1.5 mm. long. Larval skins pale brownish yellow, extending beyond the front margin of the scale.

(Body) Oblong. Cephalothorax a little wider than the abdomen, with a short, but distinct, rounded tubercle on each side. Antennae with a long bristle. Anterior spiracles in a circular more or less defined area, with about 40 parastigmatic pores in a dense group encircling the distal part; posterior spiracles in an oval defined area, with about 10 pores. Rostal loop not reaching the posterior spiracles. Abdominal segments defined; the last 2 segments convex laterally, with transverse series of some dorsal glands as large as those on the pygidium, about 7 laferal glands and some gland spines on each side both smaller than those on the pygidium (gland spines 6 on the penultimate segment, about 9 on the last); the preceding segment with about 5 minute lateral glands, and a rather large oval defined area near each side, lacking lateral gland spines. 4 pairs of areolations present on the abdomen. Length of body—about 1.1 mm.

(Pygidium) Wider than long, with many dorsal longitudinal lines. Anal opening circular, nearly at the center. Dorsal gland orifices about 13–15 on each side in 3 rows; the glands longer than wide. Marginal glands 7 on each side, of which the postorior 3 are sometimes more slender. Median lobes in an incision, rounded apically, roughly serrate, parallel on the basal halves of the mesal sides, but diverging on the distal part, rather closely placed, contigenous at the bases, slightly con-

cave at the outer margin; the 2nd lobes divided; the inner lobules a little longer than wide, rounded apically, very slightly notched on each side; the outer lobules a little shorter, a little notched on the outside, rounded apically; the 3rd lobes dis-

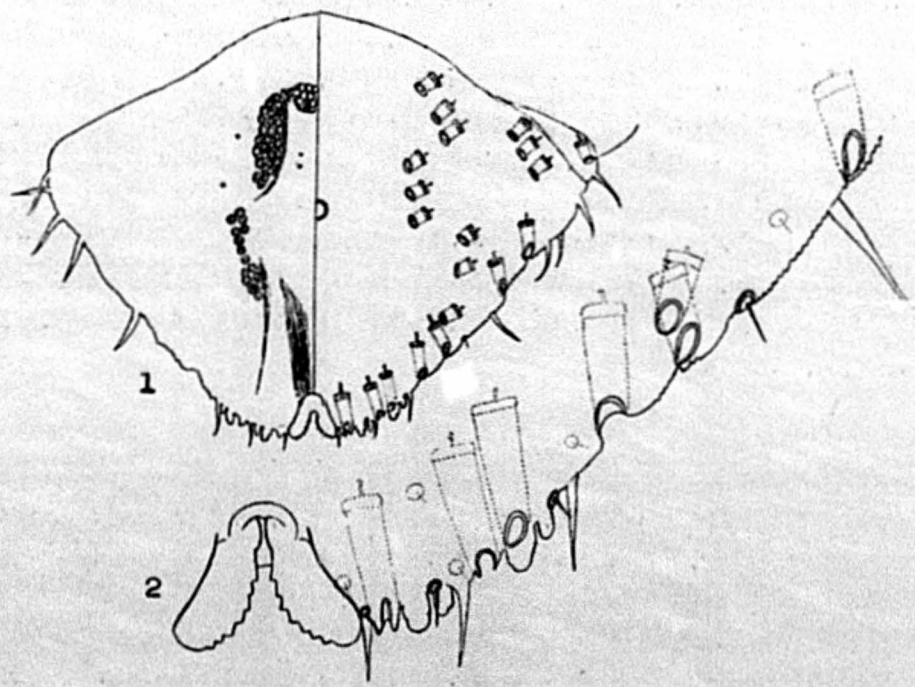


Fig. 3.

Phenacaspis formosana n. sp.

(Adult female)

(1) Pygidium. (2) Margin of pygidium.

tinct, divided; the inner lobules rounded apically, serrate on the outer margin, a little wider than long; the outer lobules smaller, nearly similar in shape. Gland spines 8 on each side, long, slender. Circumgenital pores in 5 groups, the median group with about 14–16 pores, the upper lateral with about 27, the lower lateral with about 18–26.

Host.—Wikstroemia sp., attacking the lower side of leaf.

Hab.—Ikenohata (Rato-Gun).

Collected by me on Aug. 1, 1933. Closely allied to *Phenacaspis fujicola* KUWANA, but differs in the basal abdominal segment lacking lateral glands as large as those on the posterior segments and in the 3rd lobes distinct. Differs also from *P. varicosa* GREEN in lacking gland spines on the basal abdominal segment and in the shape of the 2nd and 3rd lobes, as well as in the median lobes roughly serrate.

Some related species have been described briefly from the Philippines, but it is not possible to determine them from the literature. The present species may prove to be identical with one of them, and I propose here this new name tentatively.

Chionaspis graminicola n. sp.

(Adult female) (Scale) Very long, slender, straight, somewhat broadened posteriorly, somewhat convex dorsally, with no ridge, pale yellowish brown, white on the hind end, about 5 mm. long. The 1st larval skin paler, at the front end of the scale. The 2nd skin long, narrow, very slightly broadened posteriorly, about 3.3 times as long as wide, about 1.0 mm. long; the pygidium nearly similar to that of the adult in the marginal glands, lobes and spines. Secretion occupying most of the scale.

(Body) Very long, slender, with many small glands on the side of posterior half. Antennae widely separated, with 2 long bristles. Anterior spiracles with 1 or 2 parastigmatic pores, the posterior ones lacking them. Last 3 abdominal segments convex laterally, with an eminent lateral process on each side, 2 or 3 short lateral gland spines and some lateral glands; the glands as large as the dorsal ones on the pygidium, the preceding 2 segments with some small conical spines in a group on each side. Length of body—about 1.5 mm.

(Pygidium) Much wider than long, with many longitudinal dorsal lines, the hind end nearly straight, not incised, but with a pair of very small median processes. Anal opening large, circular, near the base. Dorsal gland ofifices transversely oval, chitinized on the margin, moderate in size, distributed as shown in the figure; the glands much smaller than the marginal ones, rather small, much longer than wide. Marginal glands much longer than wide, moderate in size, 5 on each side, of which the basal one is eminently protruding. Median lobes rather large, somewhat wider than long, very broadly rounded on the distal margin, not serrate, very widely separated, parallel, shorter than the marginal glands, very slightly notched on the

Fig. 4.
Chionaspis graminicola n. sp.
(Adult female)
(1) Pygidium.
(2) Hind end of pygidium

mesal margin; the 2nd lobes divided; the inner lobules similar in shape to but much smaller than the median lobes; the outer lobules much smaller, longer than wide, conical, more or less pointed apically; the 3rd lobes absent. Gland spines 8 on each side, of which the posterior 5 are very long, and one of them is between the median lobes and twice as long as the lobes; the basal 3 very short. Circumgenital pores in 5 groups; the median group with about 2–4 pores in a row; the upper lateral with about 6–8; the lower lateral with about 4–6.

Host.—A plant of the Gramineae.

Hab.—Shinten near Taihoku.

A few specimens were taken by me in December 1932 and January 1933. This species is allied to *Chionaspis vermiformis* TAKAH., but is different remarkably in the shape of the lobes of pygidium and in many other structures.

Unaspis acuminata GREEN, var. **turpiniae** n. var.

(Adult female) Differs from the typical form (Cocc. Ceylon, II, p. 136) in the following characters:

(1) Glands on the pygidium shorter.

(2) A short usual gland spine present between the 2nd and 3rd lobes.

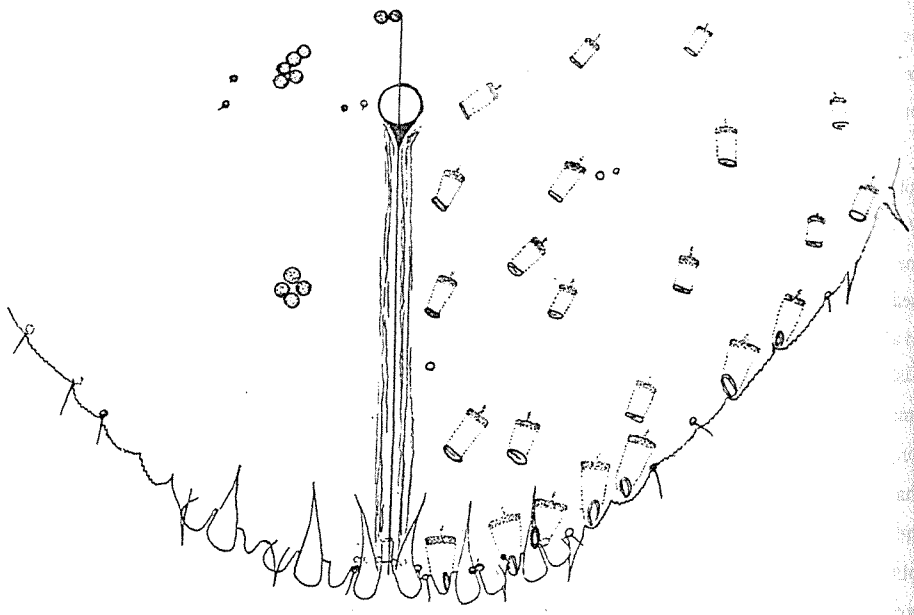


Fig. 5.
Pygidium of *Unaspis acuminata* GREEN, var. *turpiniae* n. var.
(Adult female)

(3) Cephalothorax chitinized in the old females.

(4) Median lobes broadly rounded apically.

Host.—Turpinia formosana.

Hab.—Kahodai near Hassenzan.

Some specimens were taken by me on June 6, 1933. The typical species has been recorded from Ceylon, India and China.

Tsukushiaspis bambusifoliae n. sp.

(Adult female) (Scale) Long, very narrow, convex dorsally, straight or slightly curved, parallel on the sides, slightly narrowed on the anterior portion, with no ridge, about 2.7 mm. in length. Larval skins short, pale yellow. Secretion white, scarcely extending out of the lateral margins of the skins.

(Body) Very long, narrow, broadest on the abdomen, a little narrowed towards the head, broadly rounded at the front. Antennae widely separated, nearer to the front than to the mouth parts, with 2 long curved setae. Anterior spiracles with 4-6 parastigmatic pores in a dense group; posterior spiracles without them. Abdominal segments not convex laterally, with some glands similar to those on the pygidium, some of which are arranged in rows; the last segment with a few minute gland spines nearly conical; the preceding 2 segments with some similar ones also. Length of body—about 1.5-2.0 mm.

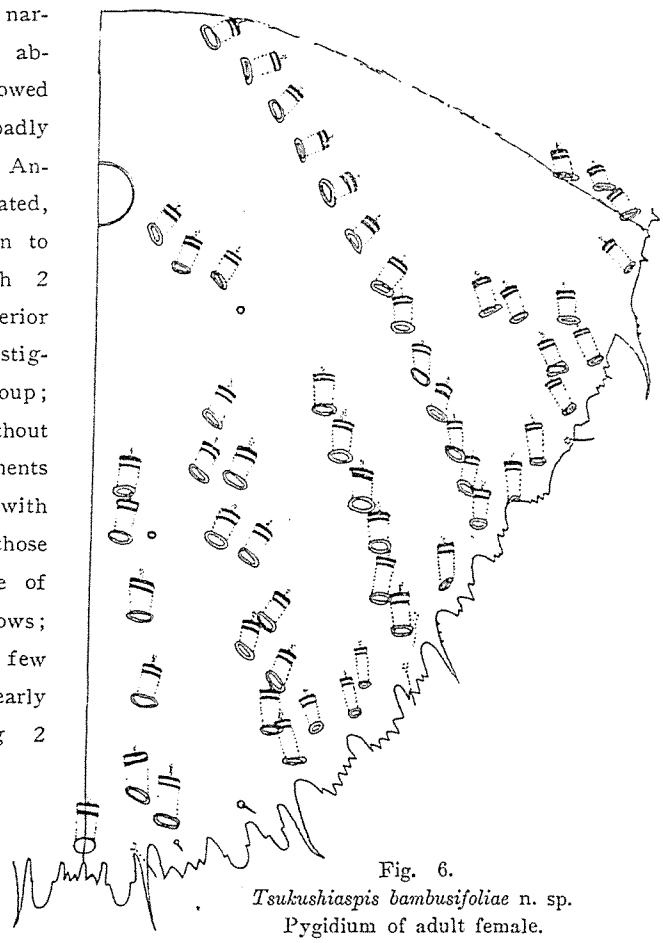


Fig. 6.
Tsukushiaspis bambusifoliae n. sp.
Pygidium of adult female.

(Pygidium) Wider

than long, rounded on the hind margin, chitinized and with many longitudinal wavy lines on the median area of dorsum. Anal opening much nearer to the base than to the apex, circular, chitinized on the margin. Dorsal gland orifices numerous, larger than the circumgenital pores, transversely oval, arranged in rows; the glands short, longer than wide, as large as the marginal ones. Marginal glands distributed as shown in the figure, a median gland present. Median lobes much longer than wide, rounded apically, distinctly notched on each side, somewhat broadened towards the base, parallel or slightly diverging, not duplex; the 2nd lobes duplicate, each lobe nearly similar in shape and size to the median ones. Fimbriated plates short, wider than long, much shorter than the lobes, 2 small ones between the median lobes sometimes united, a wide one between the median and 2nd lobes, 5 shorter ones outside of the last lobes. Gland spines long, longer than the median lobes, equal in size, 4 on each side, of which the anterior 2 are a little serrate on the basal part of the outer margin. Circumgenital pores in 5 loose groups, the median group with 2 pores, the upper lateral with 3 or 4, the lower lateral with 4–6.

Host.—Bambusa sp., attacking the lower side of leaf.

Hab.—Mt. Hichisei near Taihoku.

A few specimens were taken by me on March 27, 1932 and Sept. 23, 1933, at the summit of Mt. Hichisei (about 1100 meters above the sea level). Closely allied to *Tsukushiaspis suishana* TAKAH., but differs in the colour of the larval skins, the dorsal gland orifices on the pygidium arranged in rows, the lobes much longer than the fimbriated plates, the median lobes not duplex, the 2nd lobes duplicated, etc. Differs also from *T. vermiformis* TAKAH. in the rounded lobes and in other structures.

Tsukushiaspis hichiseisana n. sp.

(Adult female) (Scale) Elongate, somewhat narrowed anterioriy, moderately convex, not curved, about 3.5 mm. long, about 1.2 mm. wide. Secretion white, thick, not smooth on the surface, with many transverse striae, with no longitudinal ridge. The 1st skin black, pale yellowish brown on the marginal area, a little extending beyond the front of the 2nd. The 2nd skin black, narrowly brownish on the margin, extending beyond the front end of the secretion; about 1.0 mm. in length.

(Body) Elongate, broadened on the abdomen and widest at the middle of it, distinctly narrowed towards the head. Meso- and metathoraci with numerous lateral glands similar to those on the abdomen, some smaller glands present in a group

behind each anterior spiracle. Abdomen with numerous glands especially on the lateral part, and many very small short rounded tubercles in a large group mostly mesad of the lateral glands on the basal part, each of these tubercles connecting with a small gland; the segments indistinctly defined, slightly or scarcely convex laterally, the last 2 segments with 4 or 5 lateral gland spines, and some very short lateral spines representing rudimentary fimbriated plates; glands and gland spines on the abdomen similar to those on the pygidium. Antennae widely separated, with 2 long stout curved setae. Anterior spiracles with about 13 parastigmatic pores in a compact group, the posterior ones lacking them.

(Pygidium) Much wider than long, rounded on the margin, a little protruding between the median lobes, chitinized and with longitudinal wavy lines on the median area of dorsum, with about 3–6 pairs of chitinized areas on the dorsum, which are also with distinct wavy lines. Anal opening subcircular, chitinized on the margin, nearer to the base. Dorsal gland orifices oval, numerous, chitinized on the margin, more numerous towards the margin, distributed as shown in the figure; the glands longer than wide, as long as the marginal ones. Marginal glands numerous, a median one present. Median lobes much longer than wide, rounded apically, a little notched on each side, tapering on the distal part, nearly parallel, sometimes duplex; 3 or 4 lateral lobes arranged approximately on each side, similar to the median ones. Fimbriated plates well developed, variable in shape and number, nearly as long as or slightly shorter than the lobes, 2 or 3 between the median lobes, 2 between the median and lateral lobes, many (about 19) outside of the last lobes; the basal ones shorter. Gland spines a little longer than the lobes, expanded basally, about 7 on each side. Circumgenital pores in 5 groups, the

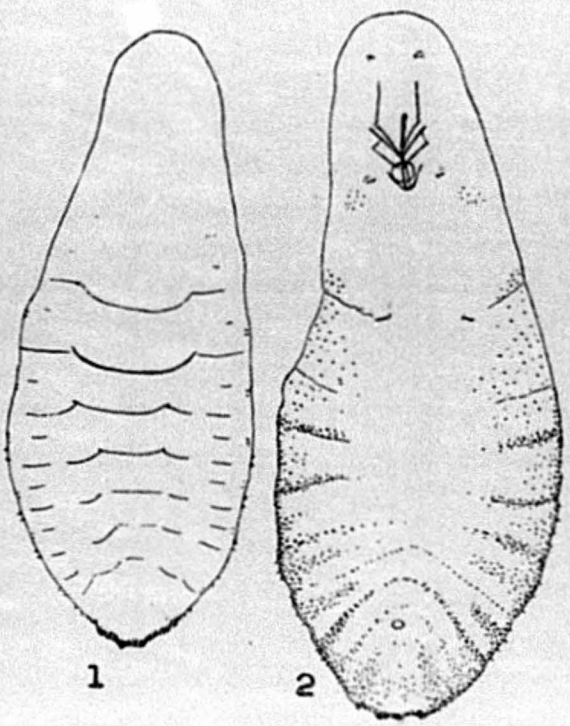


Fig. 7.
Tsukushiaspis hichisesana n. sp.
(1) 2nd larval skin.
(2) Body of adult female.

median group with about 11–17 pores, the upper lateral with about 17–30, the lower lateral with about 20–32.

Host.—Bambusa sp., attacking the upper side of leaf along the midrib.

Hab.—Mt. Hichisei near Taihoku.

Many young adult and a few dead old females were observed by me at the top of Mt. Hichisei (altitude about 1100 meters) on Sept. 23, 1933. This species is closely allied to *Tsukushiaspis shiranensis* KUWANA, for which *Nikkoaspis* KUWANA was proposed, but may be separated by the more narrow body and the lobes rounded apically. *T. formosana* TAKAH. is also an allies species, but differs from *T. hichiseisana* in the lobes broader, the 2nd skin wider, the pygidium comparatively

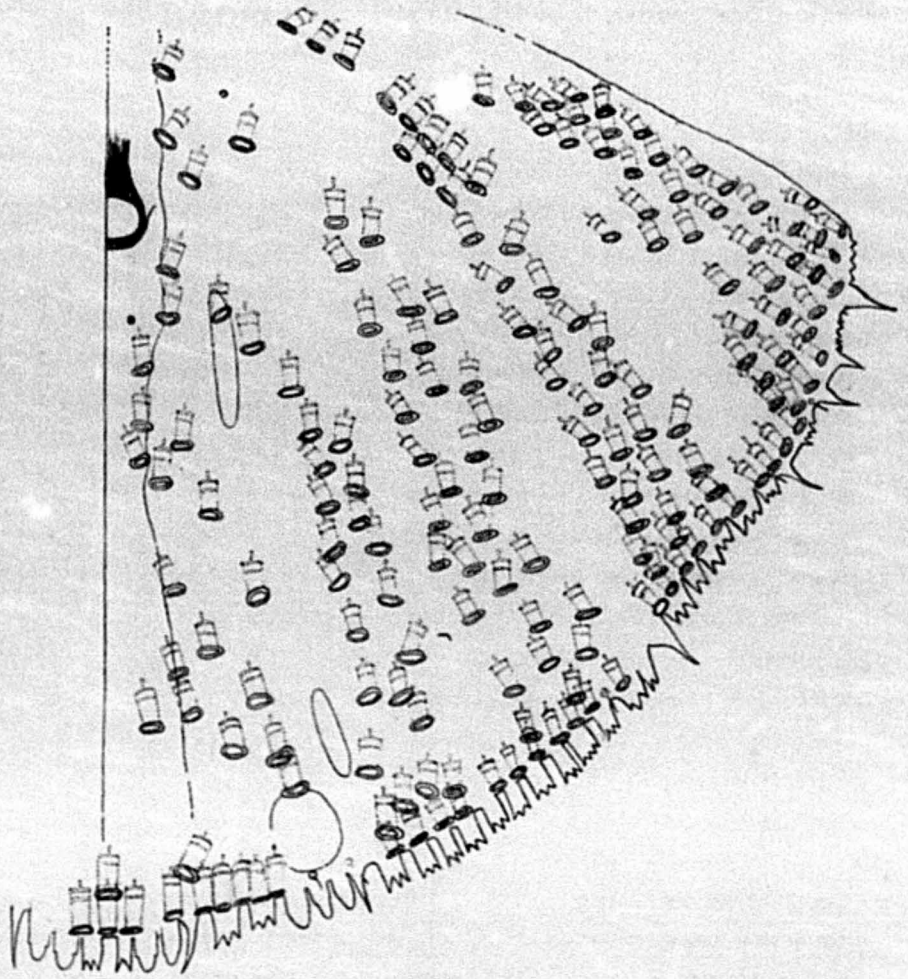


Fig. 8.
Tsukushiaspis hichiseisana n. sp.
Pygidium of adult female.

smaller, and in the gland spines longer and more in number (about 16 on each side), as well as in other characters. In my opinion *Nikkoaspis* KUWANA is not distinguishable from *Tsukushiaspis*.

Leucodiaspis hydrangeae n. sp.

(Adult female) (Scale) Long, narrow, straight, strongly convex dorsally, tapering on both ends, blackish brown, about 2.0 mm. long. The 2nd skin long, narrow, strongly convex, straight, nearly parallel on the sides, about 2.0 mm. in length, with about 28 processes in a row on each side; 2 pairs of lobes on the pygidium equal in size, parallel, longer than wide, broadly rounded apically, distinctly notched on each side about the middle, not tapering; fimbriated plates wide, as large as the lobes, longer than wide, 2 between the median lobes, 2 between the median and 2nd lobes, 3 outside of the 2nd lobes; about 6 wide fimbriated plates and processes on each side outside of the plates above mentioned.

(Body) Elongate, narrow, slightly narrowed towards either end which is rounded, with the segmentation distinct. Antennae a little nearer to the mouth parts than to the front margin, rather closely placed, with 4 long bristles. Anterior spiracles with 9–14 parastigmatic pores in a dense group, the posterior ones a little longer, lacking pores. Head and prothorax fused together, nearly as long as the abdomen including the pygidium; head elongated in front of the mouth parts. Many processes arranged in a row on each side, the row reaching a little beyond the mouth parts; the processes chitinized, expanded on the basal part, truncate apically, each connecting with a small gland, and about 16 of them, on the posterior part much larger, much longer than wide, as long as the 2nd lobes, more densely arranged; some small glands present along the margin. Median area of venter behind the mouth parts with numerous transverse rows of minute spinules, and some very small glands between the posterior spiracles and on the abdomen. Length of body—about 1.7 mm.

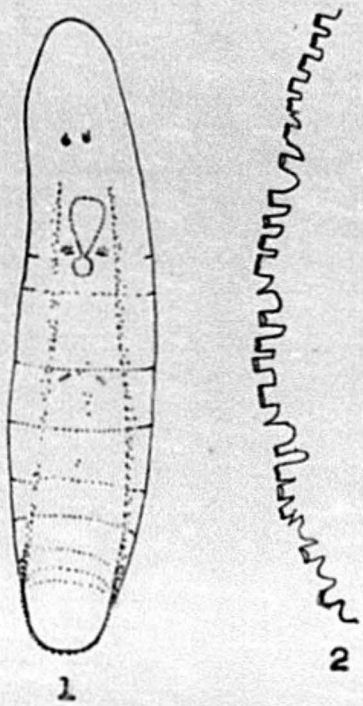


Fig. 9.
Leucodiaspis hydrangeae n. sp.
(1) Body of adult female.
(2) Margin of abdomen of 2nd skin.

(Pygidium) Broadly rounded on the hind margin, a little notched at the hind end. Dorsum with many longitudinal wavy lines, and 10 large chitinized parts on each side, of which one near the anal opening is much elongated longitudinally. Dorsal gland orifices 10 on each side, the glands nearly similar to the marginal ones. Marginal glands rather small, longer than wide, larger than the marginal ones on the anterior part of abdomen, 7 on each side, a median one present. 2 pairs of lobes well developed, conical, much longer than wide, sharply pointed, not notched, chitinized, parallel; the 2nd lobes not duplex, a little smaller than the median. 2 slender fimbriated plates between the median lobes a little converging, 2 similar plates present between the median and 2nd lobes, and also outside of the 2nd lobes, these plates a little widened on the distal part, eminently fimbriated, nearly as long as or a little longer than the median lobes; 6 shorter but wide fimbriated plates present outside of the slender plates above described.

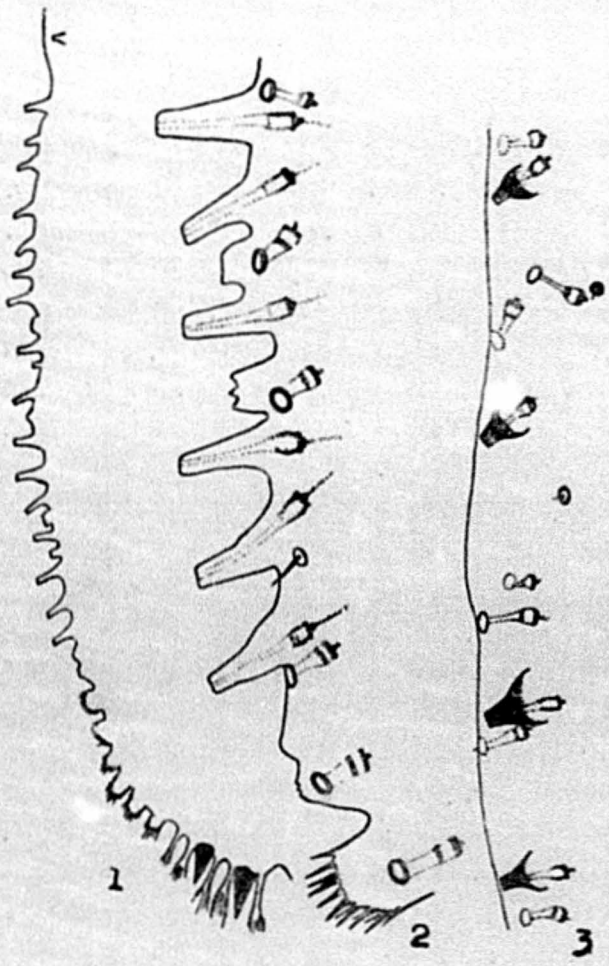
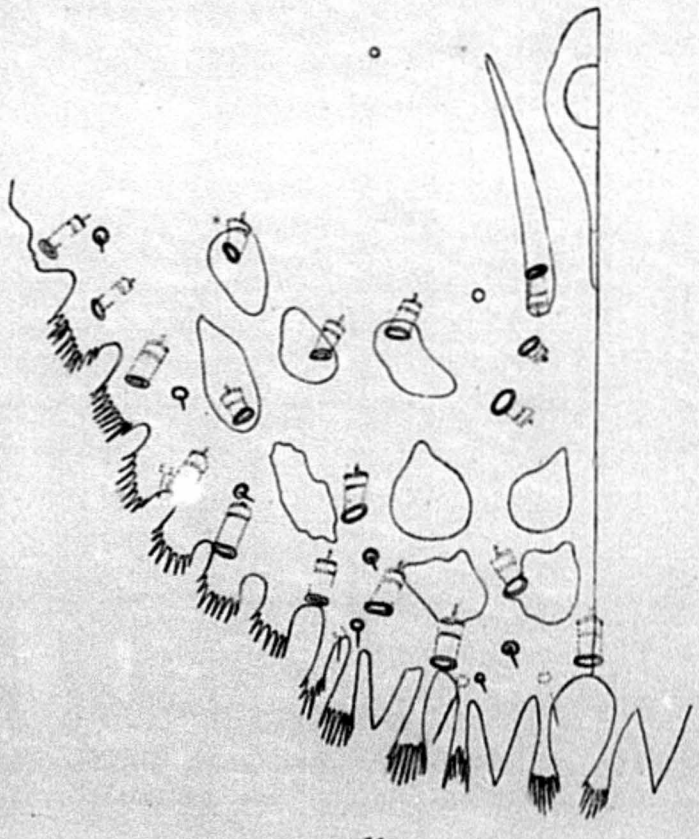


Fig. 10.
Leucodiaspis hydrangeae n. sp.
(Adult female)
(1) Margin of posterior part of abdomen.
(2) Margin of abdomen anterior to pygidium, including a fimbriated plate on pygidium.
(3) Margin of anterior part of body.

Anal opening circular, rather large, chitinized on the margin, nearer to the base than to the apex. Circumgenital pores in 5 dense groups, nearly forming an arch, the median group with about 7–9 pores, the upper lateral nearly confluent with the median, with about 10–14 pores, the lower lateral separated from the upper,

with about 13–20 pores; in addition to these pores there are 2 small supplementary groups of pores on each side, situated respectively on the 2 preceding segments, as in *L. japonica* CKLL., each group consisting of about 4–7 pores. Venter with 3 pairs of small setigerous pores in front of and also behind the circumgenital pores. Some setae present on the posterior part as shown in the figure.



g. 11.
Leucodiaspis hydrangeae n. sp.
Pygidium of adult female.

(Male scale) Narrow, narrowed on the anterior part, convex dorsally, white, about 2.0 mm. long. Skins yellowish brown, covered with a white secretion, the 2nd skin about 0.7 mm. long.

Hosts.—Hydrangea integra, H. sp.

Hab.—Sozan near Taihoku, Suisha.

Described from specimens collected by me on June 11, 1933. Related to *Leucodiaspis cockerelli* DE CHARMOY and *L. japonica* CKLL., especially to the former, but differs remarkably in the shape of body and the lobes on the pygidium not notched, and also in some other characters. Differs from *L. japonica* var. *darwiniensis* GREEN on *Ficus* in Australia in the median lobes not lanceolate, and in the presence of many lateral fimbriated plates on the pygidium, as well as in other structures.

The females and males are found along the margins of leaves and the latter are as common as the former. According to Lindinger, *Leucaspis* TARG. is a synonym of *Lencodiaspis* SIGNT. (Ent. Zeits. Frankfurt—M., XLVI, p. 107).

Poliaspis pini MASKELL.

FERNALD, Cat. Cocc. World, p. 244 (1903); KUWANA, Nippon Kaigara-mushi Zusetsu, I, p. 152 (1911); Dept. Finance, Imp. Plant Quarantine Serv., Tech. Bull., No. 1, p. 1 (1925).

Host.—Pinus thunbergii.

Hab.—Taihoku, Hokuto, Sozan.

Very common, but hitherto unrecorded from Formosa. Probably introduced from Japan.

Lepidosaphes crawii COCKERELL.

FERNALD, Cat. Cocc. World, p. 307 (1903); KUWANA, Dept. Finance, Imp. Plant Quarantine Serv., Tech. Bull., No. 2, p. 15 (1925).

Hosts.—Lithocarpus uraiana, Castanopsis sp.

Hab.—Suisha, Rirei in Tosei-Gun, Hinokiyama near Urai.

Very common, but has not been recorded from Formosa.

Lepidosaphes lithocarpi n. sp.

(Adult female) (Scale) Brownish yellow, a little shining, long, narrow, slightly narrowed on the anterior part, slightly convex dorsally, nearly straight or a little curved, with a very narrow thin whitish secretion on the margin, about 2.5 mm. long. The 1st skin a little extending beyond the front of the 2nd. The 2nd skin about 0.7 mm. long, with 5 marginal glands on each side of pygidium, the basal one being smaller; median lobes as in the adult, the 2nd lobes not divided, as in the inner lobules of adult in shape.

(Body) Elongate, narrow, a little broadened towards the abdomen, with some small glands on the sides of meso- and matathoraci. Antennae not closely placed, with a very long bristle and a shorter one. Anterior spiracles with 1 or 2 parastigmatic pores, but the posterior ones lacking them. Abdominal segments eminently projecting laterally, with no lateral chitinized tubercles; the lateral projections rounded apically, each with a distinct gland at the apex; the last 3 segments with transverse series of gland orifices; the last 2 with 2 gland spines on the tip of the projection, the preceding segment with 3 or 4 lateral spines on the projection; the basal segment with the projection wider and provided with some small glands and very small conical spines. Length of body—about 1.0 mm.

(Pygidium) Much wider than long, with many longitudinal lines on the dorsum.

Anal opening much nearer to the base than to the tip. Dorsal gland orifices about 9–11 on each side, one of which is near the hind margin; the glands stout, short, longer than wide. Marginal glands much larger than the dorsal, rather stout, large, 6 on each side. Median lobes large, a little wider than long, broadly rounded apically, notched on each side, more distinctly so on the mesal side, not narrowed

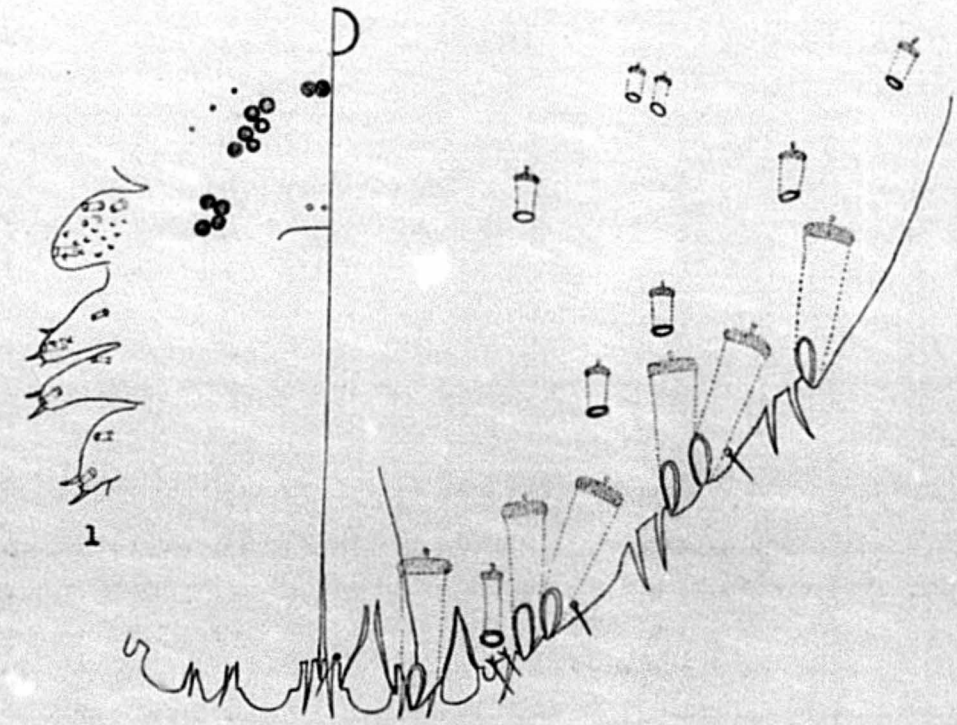


Fig. 12.
Lepidosaphes lithocarpi n. sp.
(Adult female)
(1) Lateral part of abdomen. (2) Pygidium.

basally, nearly parallel or very slightly diverging; the 2nd lobes divided, the inner lobules a little smaller than the median lobes, wider than long, broadly rounded obliquely on the distal margin, with the mesal side longer than the outer, not notched; the outer lobules very small, somewhat longer than wide, rounded apically. Gland spines a little longer than the median lobes, 8 on each side. Circumgenital pores in 5 groups, the median group with about 3–6 pores in a row, the upper lateral with 6, the lower lateral with 4.

Hosts.—Lithocarpus spp., attacking the leaf.

Hab.—Hori, Suisha.

Collected by me in June 1933. Allied to *L. lasianthi* GREEN, *L. pallida* GREEN and their relatives, but differs in the abdomen eminently projecting laterally. Differs also from *L. ficicola* TAKAH. in many characters.

Fiorinia proboscidaria GREEN, var. **randiae** n. var.

(Adult female) (Scale) Shining yellowish brown. The 1st skin paler, extending beyond the anterior end of the 2nd. The 2nd skin long, narrow, sometimes slightly curved, about ·1.8 mm. long, with a distinct longitudinal carina and 3 pairs of lateral spines, of which the last pair is much shorter; the pygidium with 4 pairs of stout marginal glands, and lobes as shown in the figure.

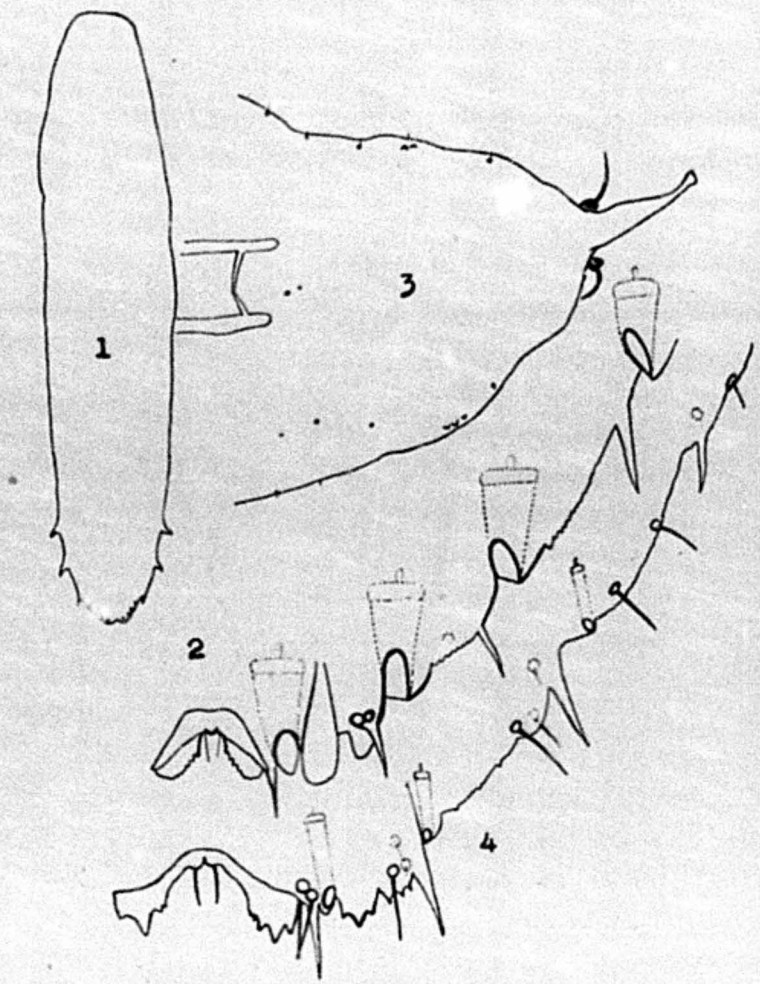


Fig. 13.

Fiorinia proboscidaria GREEN, var. *randiae* n. var.

(1) 2nd larval skin.
(2) Margin of pygidium of 2nd skin.
(3) Anterior part of adult female.
(4) Margin of pygidium of adult female.

(Body) Elongate, produced into an eminent process between the antennae, which is constricted near the tip, broadened towards the base and not striate. Antennae with a very long stout bristle. Cephalothorax with 2 or 3 minute rounded tubercles on the side. Anterior spiracles with about 4 parastigmatic pores; the posterior ones lacking them.

(Pygidium) Wider than long. Anal opening nearer to the base than to the apex, Dorsal gland orifices absent. Marginal glands slender, 3 on each side. Median lobes narrowed on the basal half, very roughly serrate, widely diverging; the 2nd lobes distinct, short, but wide, divided, each lobule with 3 small pointed processes; the outer lobules a little shorter. Gland spines long, slender, pointed, 4 on each side. Some long stout bristles present on the margin. Circumgenital pores in 5 groups; the lower lateral group with about 20 pores, pores of other groups can not be counted in my specimens which are not complete.

Host.—Randia canthioides.

Hab.—Hori.

Some specimens were taken by me on June 10, 1933. Differs from the typical species in the presence of eminent gland spines on the pygidium. In Formosa *Fiorinia proboscidaria* GREEN has been found on *Citrus* and *Eugenia*.

Fiorinia theae GREEN, var. **turpiniae** n. var.

(Adult female) (Scale) Brownish yellow or dark yellowish brown, a little shining, elongate, convex on the dorsum, with a distinct median carina, about 1.55 mm. long. The 1st skin reaching beyond the front of the 2nd. The 2nd skin elongate, about thrice as long as wide, a little tapering on the posterior part, with 3 distinct spines on the side; the pygidium nearly as in the typical form; the anterior end usually with a somewhat defined area where it is overlapped by the 1st skin. Length of 2nd skin—about 1.45 mm.

(Body) Elongate, a little narrowed on the anterior part, with many minute glands nearly in a row on the side. Process between the antennae eminent, much longer than wide, truncate apically. Antennae nearly at the base of the process, with a long bristle. Spiracles not curved, with no para-stigmatic pores.

(Pygidium) Wider than long, with many longitudinal lines on the dorsum. Anal opening nearer to the base than to the apex. Median lobes in a shallow incision, large, wide, serrate, parallel; the

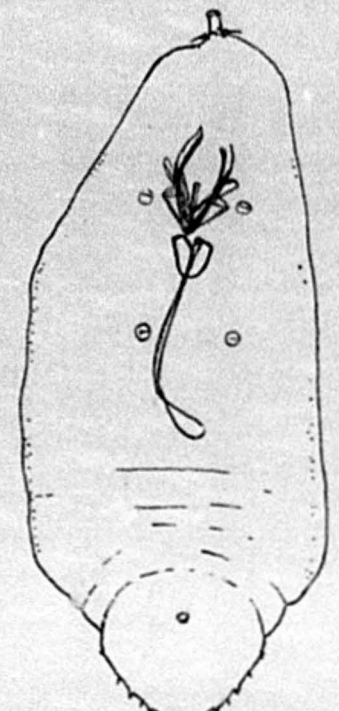


Fig. 14.
Fiorinia theae GREEN, var. *turpiniae* n. var.
Body of adult female.

2nd lobes divided, very short, the inner lobules much wider than long, with 3 teeth, the outer lobules nearly similar in shape to, but a little shorter than, the inner. Marginal glands distinct, not thin, 4 on each side. Gland spines eminent, nearly conical, not pointed, much expanded basally, extending beyond the apices of median lobes, 5 or 6 on each side, each with a small thin gland on the basal part. Some very long bristles present on the margin as shown in the figures. Circumgenital pores in 3 groups; the upper group with about 26 pores, of which those on the median part are arranged in a transverse row; the lower lateral group with about 16 pores.

Host.—Turpinia formosana.

Hab.—Kahodai near Hassenzan.

Collected by me on June 6, 1933. Differs from the typical form in the 2nd skin a little wider and with a defined area on the anterior extremity, in the presence of 4 pairs of stout marginal glands on the pygidium, and in the absence of lateral tubercles on the body.

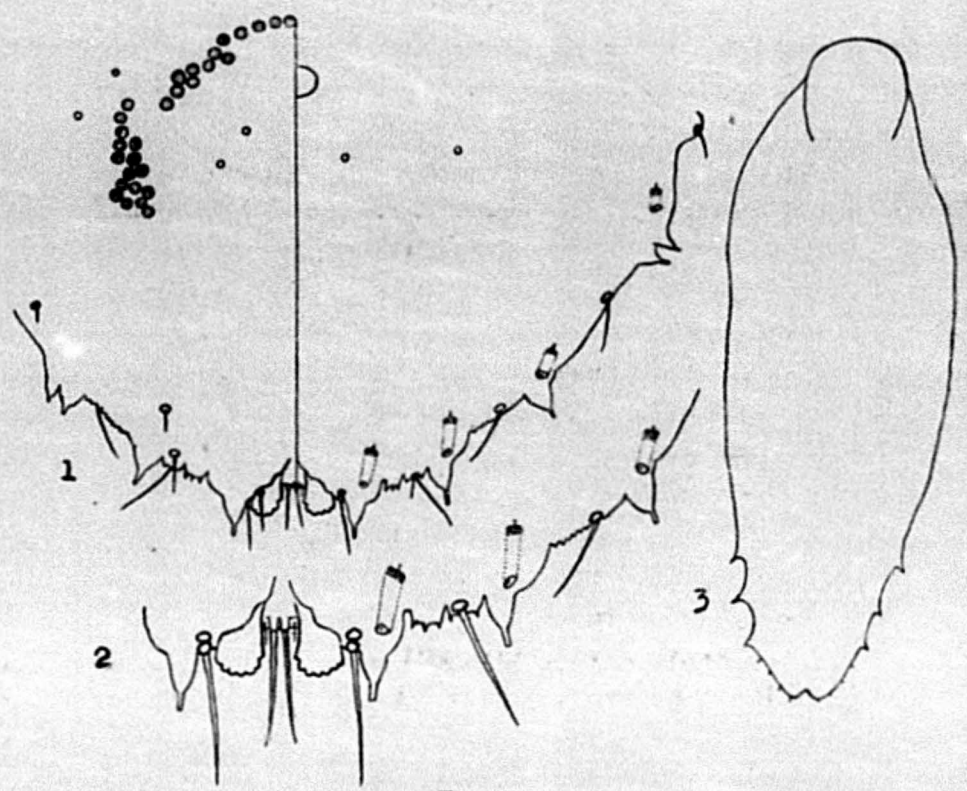


Fig. 15.

Fiorinia theae GREEN, var. *turpiniae* n. var.

(1) Pygidium of adult female (thin glands accompanying gland spines not indicated).
(2) Posterior margin of pygidium of adult female. (3) 2nd skin.

Fiorinia smilaceti TAKAH.

Bull. Ent. Res., XXII, p. 218 (1931).

Hosts.—Smilax sp. (Liliaceae), Lindera communis (Lauraceae), attacking the lower surface of leaf.

Hab.—Shinten, Hinokiyama near Urai.

Many specimens were collected on *Lindera* at Hinokiyama by me on July 31, 1933. This species is polyphagous, but the leaves of the hosts are on the lower

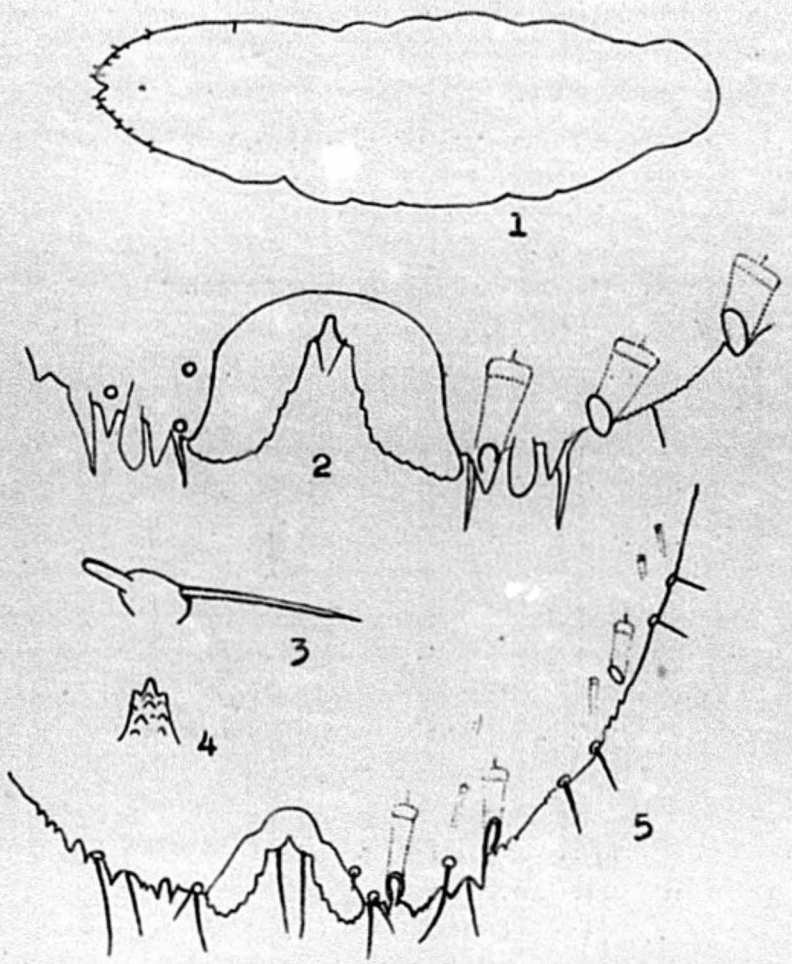


Fig. 16.

Fiorinia smilaceti TAKAH. on *Lindera*.

(1) 2nd larval skin. (2) Hind margin of pygidium of 2nd skin.
(3) Antenna of adult female. (4) Frontal process of adult female.
(5) Margin of pygidium of adult female.

surface not smooth, covered with hairs, whitish, and with the ribs elevating. The females are located along the ribs, and the white male scales are as numerous as the females. As there are some mistakes in the original description, corrections are made here, with supplementary notes as follows:

(Adult female) Pygidium with 3 pairs of marginal glands, and about 5 small slender glands on the submarginal area of each side. Antennae very closely placed, with a stout process which is not discernible in some specimens. Head with a minute frontal process which is not discernible in most specimens on *Smilax*. Body with 2 distinct lateral gland spines which are conical, pointed and much longer than wide.

Fiorinia taiwana n. sp.

(Adult female) (Scale) Elongate, flattened, pale brownish yellow, usually covered with a thin white secretion, with an indistinct median ridge, about 1.4 mm. long. The 1st skin extending beyond the front margin of the 2nd. The 2nd skin elongate, not rounded on the front margin, nearly parallel on the sides or a little broadened on the posterior part, nearly straight or a little curved, about 1.25 mm. long, with 2 pairs of short lateral gland spines in front of the pygidium; the pygidium with 5 stout marginal glands and 3 gland spines on each side, the basal marginal gland sometimes a little narrower; median lobes in an incision, serrate, diverging; the 2nd lobes distinct, divided, variable in shape (see the figure).

(Body) A little broadened towards the abdomen, with about 10-12 short gland spines in an interrupted row on the side; the last 2 segments with a lateral spine a little longer. Front with a very small, but distinct, process between the antennae, which is conical, rounded apically and with many minute spine-like points. Antennae rather closely placed, with a short process and a very long stout seta slig ly curved. Anterior spiracles with 3 parastigmatic pores, but the posterior pair wanting them.

(Pygidium) Much wider than long, with many longitudinal wavy lines on the dorsum. Anal opening nearer to the base. A pair of very small circular pores present behind the anal opening. Marginal glands distinct, variable in number from 2-5, rather slender; some small thin submarginal glands also present, which are variable in number too. A distinct gland spine present near the base; some long marginal bristles also present. Median lobes serrate, diverging, in a distinct incision; 2nd lobes distinct, pointed, divided, small; the outer lobules very small. Circumgenital pores in 5 groups; the median group with about 6 pores mostly in a row; the upper lateral nearly confluent with the median, with about 10-12 pores;

the lower lateral with about 12–14.

Hosts.—Quercus glauca, Myrica rubra.

Hab.—Taihoku, Shirin, Sozan.

Very common on *Quercus* at Shizangan, Shirin. Described from specimens taken by me on Oct. 11, 1931. This species is closely allied to *Fiorinia saprosmae*

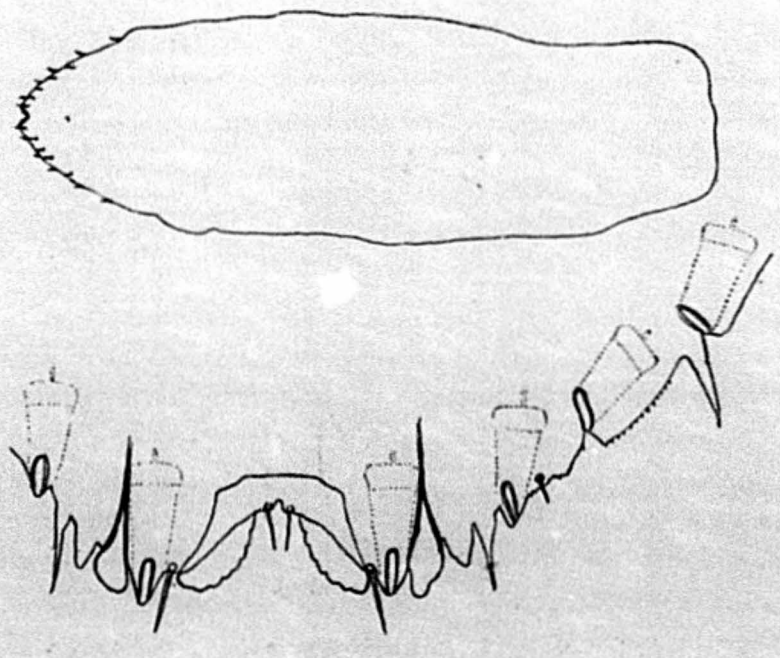


Fig. 19.

Fiorinia taiwana n. sp.

2nd skin and margin of its pygidium.

GREEN, and I have listed the species under that name in the food plant catalogue of the Formosan Coccidae (Dept. Agric., Gov't. Res. Inst. Formosa, Rept. No. 60, p. 32), but differs in the narrower 2nd skin without an eminent projection on the side of abdomen, as well as in other characters. Judging by KUWANA's description and figures, this species comes near *Fiorinia vaccinii* KUWANA also, but the interantennal tubercle is wider, the body is narrower anteriorly, and the 2nd skin is also narrower; and it differs in other characters too. This species is also closely allied to *Fiorinia formosensis* TAKAH., in which the interantennal tubercle is tricuspid or with many minute spines as in *F. saprosmae* GREEN, but differs in the marginal glands slender, the 2nd lobes distinctly or more or less pointed apically, the pygidium lacking gland spines on the posterior part, etc. *Fiorinia saprosmae* GREEN has been found in Kotosho (Botel Tobago), but not in Formosa.

The females locate themselves along the margins and ribs of the leaves, while the males group on the middle areas. The males predominate the females in num-

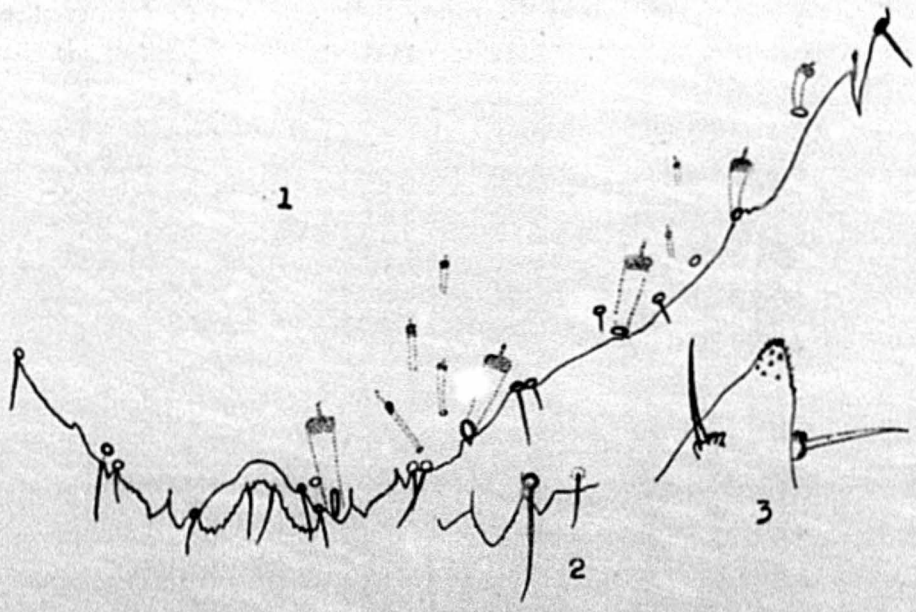


Fig. 18.
Fiorinia taiwana n. sp.
(Adult female)
(1) Pygidium. (2) 2nd lobe of specimen on *Myrica rubra*.
(3) Frontal process extracted.

ber, and the leaves on the surface surrounding the males are a little covered with white cottony secretions.

Fiorinia taiwana TAKAH., var. **arengae** n. var.

(Adult female) Differs from the typical form in the following characters:

(1) Interantennal tubercle variable in shape and length, but usually long, slender.

(2) Antennae with 2 or more long processes which are sometimes absent.

(3) Body with more lateral gland spines.

(4) Pygidium with no gland spines; median lobes more roughly serrate, pointed at the hind end; marginal glands 3 on each side.

(5) 2nd lobes of the 2nd skin not intruding forewards, distinctly longer than wide, narrower.

Host.—Arenga engleri.

Hab.—Kuraru.

Some specimens were collected by me on May 25, 1932. This form closely resembles also *F. vaccinii* KUWANA, but differs in the 2nd lobes pointed and in the fewer marginal glands on the pygidium, as well as in the 2nd skin narrower. Length of 2nd skin—about 1.5 mm.

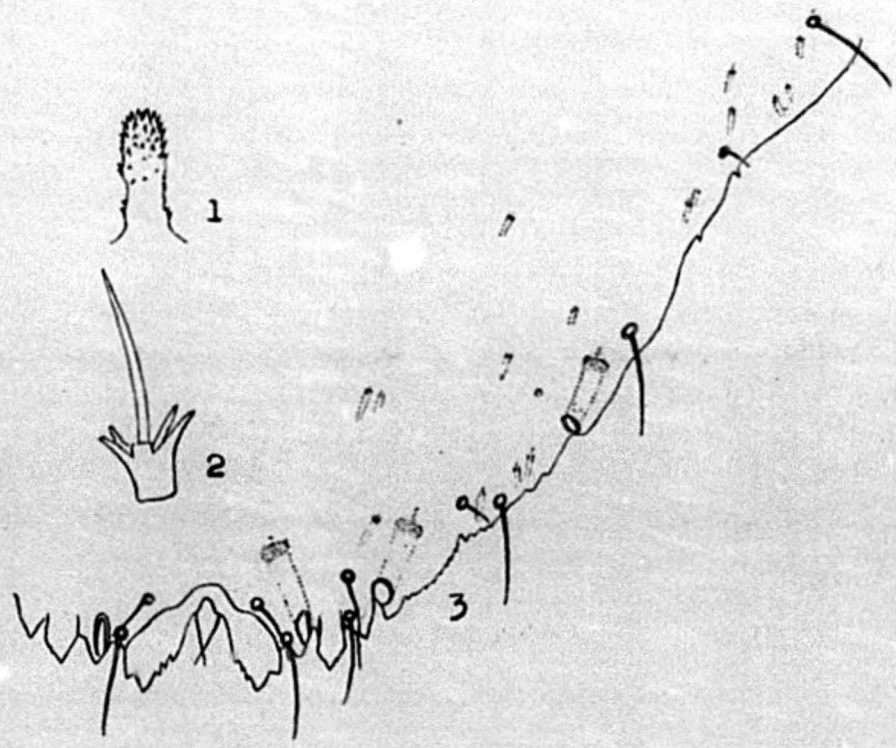


Fig. 19.

Fiorinia taiwana TAKAH., var. *arengae* n. var.

(Adult female)

(1) Frontal process. (2) Antenna. (3) Pygidium.

Fiorinia horii KUWANA.

Ann. Zool. Jap., XI, No. 2, p. 151 (1927).

Host.—Rhododendron sasakii.

Hab.—Hori, Suisha, Rirei near Kurasu (Tosei-Gun).

Very common. Previously known from Japan. Not found on *Rhododendron* near Taihoku.

Parlatoria mytilaspiformis GREEN.

Cocc. Ceylon, II, p. 164 (1899); FERNALD, Cat. Cocc. World, p. 319 (1903).

Host.—Camellia thea, attacking the upper side of leaf along the midrib.

Hab.—Gyochi.

Some specimens were collected by Mr. J. SONAN in September 1933. New to Formosa. The body of adult female has a few small conical tubercles and some small thin glands on each side, but no lateral spine on the cephalothorax; the pygidium is provided with some small thin dorsal glands in a pair of groups on the basal part. Differs from the original description in the presence of 2 parastigmatic pores in front of each anterior spiracle.

Neoparlatoria lithocarpi n. sp.

(Adult female) (Scale) Oval or nearly circular, a little longer than wide, flattened, thin, about 1.25–1.5 mm. long. The 1st skin black, narrowly brownish on the margin, subcircular, a little longer than wide, a little narrowed on the hind part, nearly at the center or on the anterior part of the 2nd skin, about 0.45 mm. long, with a pair of eminent lobes at the hind end, which are serrate on the margin. The 2nd skin pale yellowish brown, broadly black longitudinally on the median area, slightly covered with a thin secretion and appears to be grayish, broad, very broadly rounded on the anterior margin, somewhat or a little narrowed posteriorly, about 1.6 or 1.7 times as long as wide, a little constricted near the pygidium, lacking lateral spines, about 1.1 mm. long; the pygidium with 4 pairs of eminent lobes and 4 pairs of marginal glands; the lobes narrowed towards the tip, rounded or more or less pointed apically, longer than wide, serrate on the outer edge; the median pair closely placed. Secretion very thin, semitransparent, pale gray, present along the whole margin ot the 2nd skin.

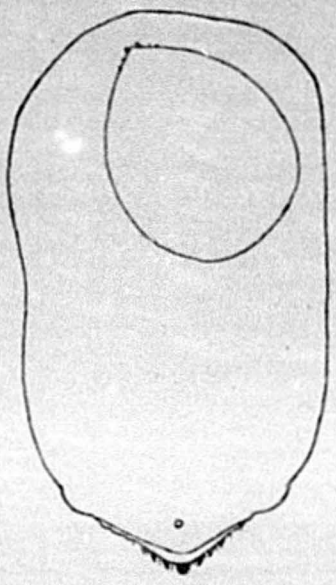


Fig. 20.
Neoparlatoria lithocarpi n. sp.
Larval skins.

(Body) Broad, broadest at midlength, with 2 groups of very small conical tubercles on each side; the anterior group with about 5 and the posterior with about 20 tubercles which are wider than long, more or less pointed apically, and each connecting

with a very small gland. Abdomen without lateral glands, but with 3 very long bristles on each side, which are as long as the marginal bristles on the pygidium. Antennae very widely separated, a little wider than long, with a very long bristle. Spiracles with no parastigmatic pores. Length of body—about 0.7 mm.

(Pygidium) Much wider than long, without lines. Anal opening subcircular, nearly at the center. Marginal glands rather small, a little longer than wide, 3 on each side, absent between the median lobes. Lobes eminent, narrowed towards the tip, pointed apically, a little longer than wide, slightly notched on the outer edge in the median and 2nd pairs; median lobes parallel, similar to the 2nd; the 3rd not notched, somewhat smaller. Marginal processes very long, much longer than the lobes, abruptly narrowed on the distal part, 2 between the median lobes, 2 between the median and 2nd lobes, 3 between the 2nd and 3rd, 3 outside of the 3rd. Some very long bristles present on the marginal area as shown in the figure, which are longer than the processes. Circumgenital pores in 4 groups, but the upper and lower groups sometimes confluent, each group with about 9 or 10 pores. Venter with some minute setigerous pores.

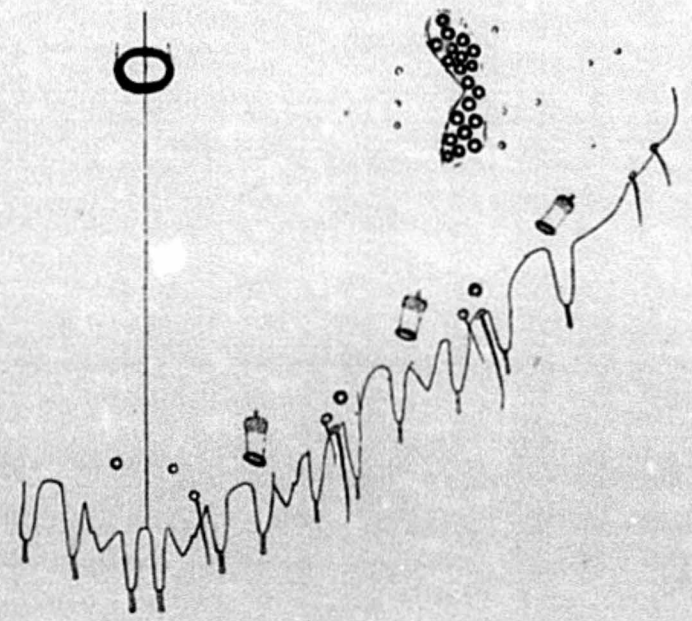


Fig. 21.
Neoparlatoria lithocarpi n. sp.
(Adult female)
Pygidium.

Host.—Lithocarpus uraiana.

Hab.—Shinten, Sozan.

This species is commonly found singly on the lower sides of the leaves, and is distinguished from *N. formosana* TAKAH. by the colour of scale, and the shape and number of the shorter processes on the pygidium, as well as by many other characters. *Neoparlatoria* TAKAH. closely resembles *Cryptoparlatorea* LINDINGER, but differs in the structures of the 2nd skin remarkably, as well as in the 1st skin located on the central part of the 2nd.

Neoparlatoria lithocarpicola n. sp.

(Adult female) (Scale) Pale yellow, flattened, thin, nearly circular, with no secretion evident, about 0.7 mm. in length. The 1st skin pale yellowish brown, with a small slightly dusky spot near the center, about 1.3 times as long as wide, at the center of the 2nd skin, about 0.34 mm. long, with the eyes near the margin; the hind margin with 4 pairs of short spine-like processes and a pair of median lobes; the lobes very closely placed, straight on the mesal edge, rounded and slightly serrate on the outer edge, much longer than wide, more or less pointed apically, nearly as long as or slightly shorter than the longest spine-like processes which are expanded basally. The 2nd skin pale yellow, circular, but protruding on the hind part, lacking lateral spines, about 0.7 mm. long, about 0.52 mm. wide; the pygidium with many wide plates on the margin.

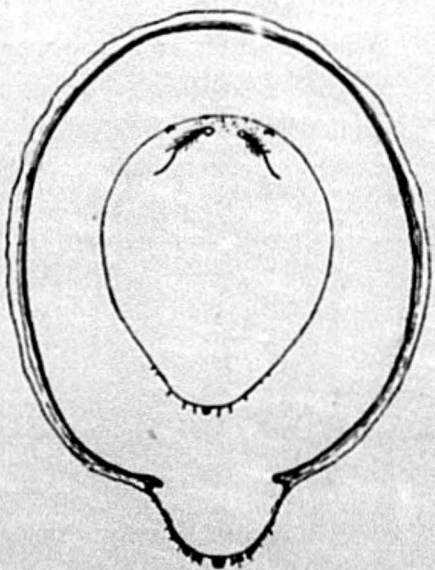


Fig. 22.
Neoparlatoria lithocarpicola n. sp.
Larval skins

(Body) Very wide, a little longer than wide, very broadly rounded on the front, abruptly narrowed on the abdomen which is contracted; with many minute slender glands on the median area, and about 22 small short conical tubercles nearly in a row on each side, without marginal glands, entirely enclosed within the 2nd skin. Antennae as long as or longer than wide, widely separated, with a long bristle. Spiracles without parastigmatic pores. Length of body—about 0.53 mm.

(Pygidium) Nearly as long as wide, with many longitudinal lines. Anal opening circular, a little nearer to the apex than to the base. Marginal glands rather small, nearly as long as the 2nd lobes, 3 on each side, absent between the median lobes. Median lobes eminent, much longer than wide, narrowed towards the tip, sharply pointed apically, serrate on the outer edge, parallel; the 2nd lobes similar in shape to, but smaller than the median; the 3rd lobes wanting. 2 furcated plates between the median lobes reaching beyond the apices of the lobes; 2 similar plates present between the median and 2nd lobes; a similar plate present also outside of the 2nd lobes; a slender process outside of the last furcated plates sharply pointed,

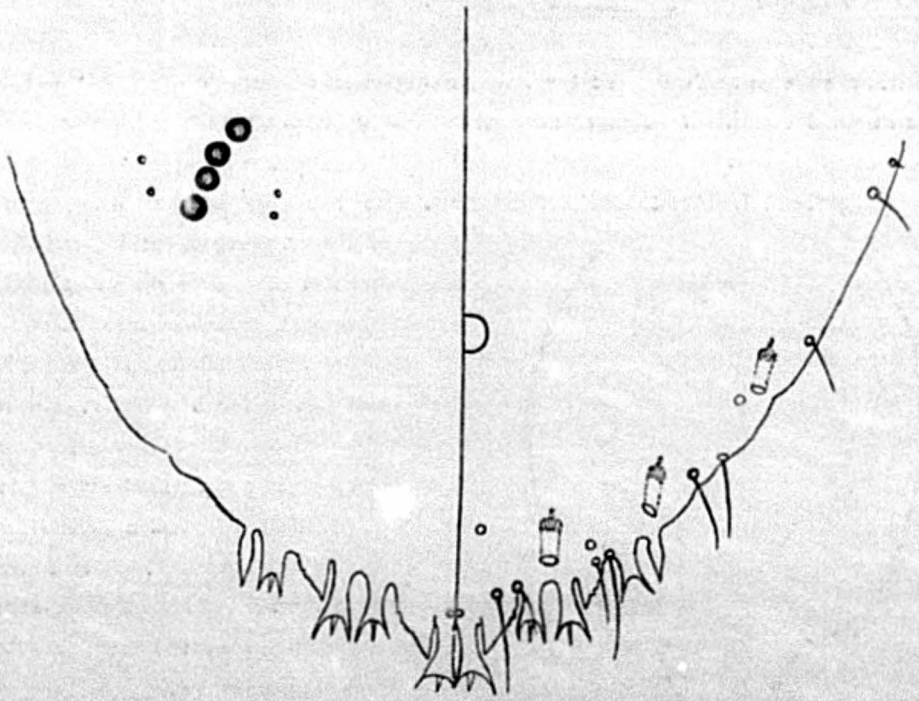


Fig. 23.
Neoparlatoria lithocarpicola n. sp.
Pygidium of adult female.

slightly constricted basally, shorter than the posterior furcated plates. Some very long stout bristles present on the margin. Circumgenital pores large, 4 or 5 arranged in a row on each side. Some very small pores also present on the venter.

Hosts.—Lithocarpus uraiana, Castanopsis sp., attacking the lower side of leaf.

Hab.—Shinten, Suisha, Kahodai and Rirei in Tosei-Gun, Hinokiyama near Urai.

Very common, occurring in abundance, but not in dense groups. Remarkably differs from other species of the genus *Neoparlatoria* in the characters of pygidium. Much resembles *Aonidia*, but differs in possessing circumgenital pores and in the structures of the larval skins.

Aonidia rarasana n. sp.

(Adult female) (Body) Wide, wider than long (excluding the pygidium), with the pygidium abruptly protruding. About 28 short stout gland spines present nearly

in a row on the posterior part of each side. Abdominal segments not protruding laterally. Antennae wider than long, with a long stout bristle. Posterior spiracles wanting parastigmatic pores; the anterior ones not discernible in my specimens not in good condition. Length of body—about 0.7 mm. Space between antennae —about 0.065 mm.

(Pygidium) Longer than wide, tapering, with many longitudinal lines over the venter. Anal opening near the base. Some very slender glands present mostly on the submarginal area. Median lobes like projections, pointed apically, slightly notched on each edge, nearly triangular when seen from above, parallel; the 2nd and 3rd lobes similar in shape, but a little shorter. A trilobed process present between the median lobes, which is longer than the lobes; a series of 7 distinct processes present on the posterior part of each side, which are divided on the distal part, rounded apically, subequal in length, and as long as the median process; 1 or 2 rudimentary processes present beyond the above-mentioned processes, 7 marginal eminent bristles present on each side. Circumgenital pores absent.

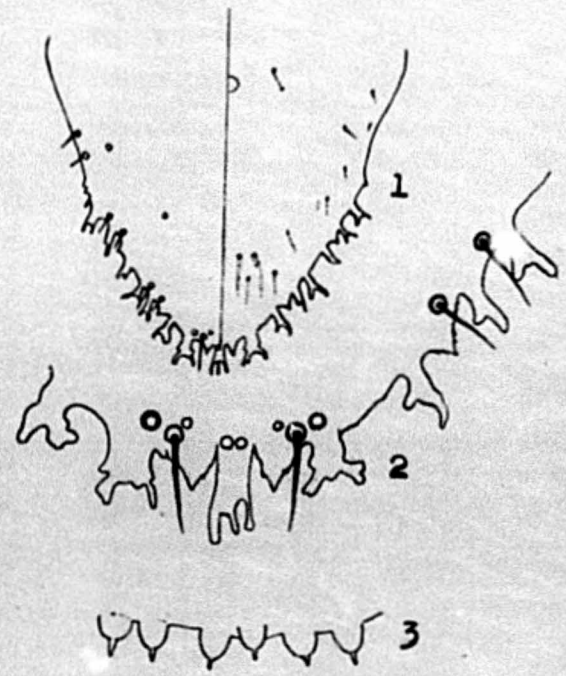


Fig. 24.
Aonidia rarasana n. sp.
(Adult female)
(1) Pygidium.
(2) Distal margin of pygidium.
(3) Lateral gland spines of body.

Host.—Unknown.

Hab.—Rarasan near Urai.

Two specimens mixed with other species were taken by me on July 31, 1933.

This species is closely allied to *Aonidia tentaculata* GREEN described from *Vateria* in India, but is easily separated from it by the wider pygidium with shorter marginal processes divided.

Aspidiotus transparens GREEN.

Ind. Mus. Notes, IV, p. 4 (1896); Jl. Bombay Nat. Hist. Soc., XIII, p. 69 (1900); Lindinger, Zeits. f. wiss. Insbiol., VII, p. 88 (1911); BRAIN, Bull. Ent. Res., IX, p. 120 (1918); GREEN, Cocc. Ceylon, p. 460 (1922).

Aspidiotus lataniae (part), Green, Cocc. Ceylon, p. 49 (1896).

Aspidiotus stauntoniae, TAKAHASHI, Dept. Agr., Gov't. Res. Inst. Formosa, Rept. No. 60, p. 54 (1933).

Hosts.—Vitis sp., Ficus sp., Stauntonia obovatifoliola.

Hab.—Shinten, Garambi, Kotosho (Botel Tobago).

This species is much fewer than *Aspidiotus destructor* SIGNT. in Formosa, to which it is very closely related, but differs in the shape of lobes on the pygidium, and also in possessing many lateral glands on the abdominal segment anterior to the pygidium as pointed out in my description of *A. stauntoniae* TAKAH. In KUWANA's figure of *A. transparens* (Diaspine Cocc. Japan, VII, Pl. V, fig. C), the 2nd and 3rd lobes are much stouter than in the Formosan specimens. The specimens from Kotosho were confused with *A. destructor* SIGNT. in my previous paper (Part I, 79). The specimens of *A. stauntoniae* TAKAH. have been compared with this species minutely, but no basis for distinguishing the two has been found.

Pseudischnaspis anassarum LINDINGER.

Mitt. Deut. ent. Gesel., III, p. 26 (1932).

Pseudischnaspis bromeliae, LINDINGER, Die Schildl., p. 67 (1912); KONOWIA, XI, p. 191 (1932); Ent. Rundschau, XLVIII, Separat-Abdr., p. 10 (1931).

Aspidiotus bromeliae, NEWSTEAD, Mon. Brit. Cocc., I, p. 86 (1900); GREEN, Jl. Econ. Biol., IX, p. 47 (1914).

Chrysomphalus bromeliae, FERNALD, Cat. Cocc. World, p. 289 (1903); TAKAHASHI, Bur. Plant Industry, Gov't. Formosa, Pub. No. 636, p. 45 (1933).

Aonidiella bromeliae, MACGILLIVRAY, Cocc., p. 444 (1921).

Host.—Ananas comosus.

Hab.—Ropi near Heito.

Recently found for the first time in Formosa. The infestation has not increased in severity.

New food plants of the Formosan Coccidae.

Adinandra sp. (Camelliaceae)

Pinnaspis uniloba KUWANA.

Ananas comosus (Bromeliaceae).

Pseudischnaspis anassarum LINDINGER.

Arenga engleri (Palmae).

Fiorinia taiwana TAKAH., var. arengae TAKAH.

Bambusa sp. (Gramineae).

Tsukushiaspis bambusifoliae TAKAH.

T hichiseisana TAKAH.

Boehmeria frutescens (Urticaceae).

Pulvinaria thespesiae GEEEN.

Boehmeria sp.

Pulvinaria thespesiae GREEN.

Bridelia ovata (Euphorbiaceae).

Chrysomphalus aurantii MASK.

Castanopsis sp. (Fagaceae).

Lepidosaphes crawii COCKERELL.

Camellia thea (Camelliaceae).

Parlatoria mytilaspiformis GREEN.

Cinnamomum randaiense (Lauraceae).

Aulacaspis yabunikkei KUWANA.

Cinnamomum reticulatum.

Aulacaspis greeni TAKAH.

Coffea arabica (Rubiaceae).

Pseudococcus lilacinus COCKERELL.

Decaspermum fruticosum (Myrtaceae).

Chrysomphalus aonidum L.

Fiorinia fioriniae TARGIONI.

Tachardina theae GREEN et MANN.

Dendrobium sp. (Orchidaceae).

Parlatoria proteus CURTIS.

Ficus foveolata (Moraceae).

Parlatoria pergandei COMST.

Ficus retusa.

Parlatoria pergandei COMST.

Pulvinaria psidii MASK.

Ficus sp.

Aspidiotus transparens GREEN.

Gardenia florida (Rubiaceae).

Chrysomphalus aurantii MASK.

Gardenia sp.

Aspidiotus cyanophylli SIGNT.

Glochidion sp. (Euphorbiaceae).

Pulvinaria thespesiae GREEN.

Gossypium spp. (Malvaceae).

Phenacoccus hirsutus GREEN.

Gramineae (a plant of the).

Chionaspis graminicola TAKAH.

Lepidosaphes sacchari HALL.

Pseudococcus shintenensis TAKAH.

Hydrangea spp. (Saxifragaceae).

Leucodiaspis hydrang[illegible]e TAKAH.

Imperata sp. (Gramineae).

Eumyrmococcus smithi SILVESTRI.

Lauraceae (a plant of the).

Cryptoparlatoria uberifera LINDINGER (syn. Silvestraspis sinensis Bellio).

Lindera communis (Lauraceae).

Fiorinia smilaceti TAKAH.

Lithocarpus spp. (Fagaceae).

Asterolecanium japonicum COCKERELL.

Diaspis manni Green.

Lepidosaphes crawii COCKERELL.

L. lithocarpi TAKAH.

Neoparlatoria formosana TAKAH.

N. lithocarpi TAKAH.

N. lithocarpicola TAKAH.

Lonicera japonica (Caprifoliaceae).

Aspidiotus destructor SIGNT.

Macaranga tanarius (Euphobiaceae).

Pseudococcus citri RISSO.

Mangifera indica (Anacardiaceae).

Parlatoria proteus CURTIS.

Myrica rubra (Myrcaceae).

Fiorinia taiwana TAKAH.

Osmanthus sp. (Oleaceae).

Paralecanium expansum GREEN.

Phalaenopsis amabilis (Orchidaceae).

Parlatoria pretcus CURTIS.

Pileostegia viburnoides (Saxifragaceae).

Pinnaspis aspidistrae SIGNT.

Pinus thunbergii (Coniferae).

Poliaspis pini MASK.

Polygonum sp. (Polygonaceae).

Coccus hesperidum L.

Psychotria serpens (Rubiaceae).

Aspidiotus cyanophylli SIGNT.

Coccus acuminatus SIGNT.

Quercus glauca (Fagaceae).

Fiorinia taiwana TAKAH.

Kuwania quercus KUWANA.

Quercus sp.

Kuwania quercus KUWANA.

Pseudaonidia trilobitiformis GREEN.

Randia canthioides (Rubiaceae).

Fiorinia proboscidaria GREEN, var. randiae TAKAH.

Rhododendron sasakii (Ericaceae).

Fiorinia horii KUWANA.

Rhododendron sp.

Icerya seychellarum WESTW.

Rhynchostylus retusa (Orchidaceae).

Diaspis boisduvalii SIGNT.

Rosaceae (a plant of the).

Pinnaspis minor MASK.

Saccharum officinarum (Gramineae).

Eumyrmococcus smithi SILVESTRI.

Sapium sebiferum (Euphobiaceae).

Aspidiotus destructor SIGNT.

Serissa japonica (Rubiaceae).

Saissetia hemisphaericum TARGIONI.

Thysanospermum diffusum (Rubiaceae).

Fiorinia theae GREEN.

Turpinia formosana (Staphyleaceae).

Fiorinia theae GREEN, var. turpiniae TAKAH.

Unaspis acuminata GREEN, var. turpiniae TAKAH.

Vitis sp. (Vitaceae).

Aspidiotus transparens GREEN.

Wikstroemia sp. (Thymelaeaceae).

Phenacapis formosana TAKAH.

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ALEYRODIDAE OF FORMOSA. III.

By

Ryoichi TAKAHASHI.

Introduction.

In the present paper I will describe 24 new species and also put on record 2 species hitherto unknown from Formosa, which have been found on various plants both cultivated and wild.

In view of the importance of these tiny insects as pests of cultivated plants and transmitters of plant diseases, I believe that this report will be found not without its use in the economic field.

All the specimens are deposited in the collection of the Department of Agriculture, Government Research Institute, Formosa.

I express here my thanks to Prof. T. SHIRAKI and Dr. K. SINGH for their kind help in various ways.

New or little-known Formosan Aleyrodidae.

Dialeurodes tetrastigmae n. sp.

(Pupa case) Slightly pale brownish, with no secretion evident. Elliptic, broad, somewhat narrowed on the posterior portion, flattened, thin, often with 2 or 3 small, but distinct, irregular indentations on the margin. Mid-thoracic suture indistinct, not reaching the margin; transverse suture (suture between the thorax and abdomen) not reaching the margin; abdominal segments distinct. Dorsum with numerous very short rounded papillae densely scattered except on the submarginal and median areas, some of which are more eminent and more deeply stained in most specimens; 30 short capitate setae arranged in a single row on the submarginal area; a pair of similar setae present on the median area of cephalothorax and on the posterior part as shown in the figure; a pair of shorter similar ones also in front of the vasiform orifice. Margin not toothed; submarginal area with markings as shown in the figure.

Thoracic tracheal folds faintly or hardly discernible; the pores small, just within the margin, closed, with about 4 rounded chitinized teeth. Caudal furrow distinct, narrowed posteriorly, slightly chitinized on the lateral margins, with many rather large chitinized irregular sculptures scattered on the whole length, which are smaller than the dorsal eminent papillae; the distal pore small, closed, with 5 teeth similar to those of the thoracic pores. Vasiform orifice rather small, subcordate, nearly as long as wide, rounded on the hind margin, not notched, with about 8 very short teeth not distinct mostly on the hind margin. Operculum wider than long, rounded on the sides, narrowed on the distal part, straight on the hind margin, occupying over half the orifice. Lingula sometimes a little exposed. Length of pupa case—about 1.5 mm.

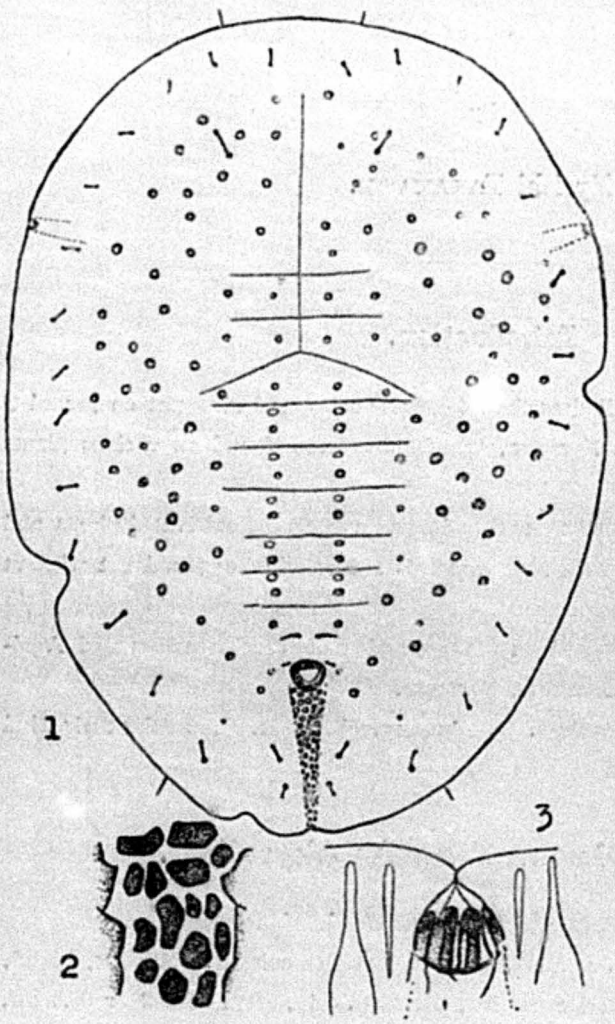

Fig. 25.

Dialeurodes tetrastigmae n. sp.
(Pupa case)

(1) Outline (only more eminent papillae are indicated).
(2) Sculptures on caudal furrow.
(3) Thoracic tracheal pore and submarginal area.

Host.—Tetrastigma umbellata.

Hab.—Rirei in Tosei-Gun.

Some specimens were collected by me on June 6, 1933. This species is allied to *Dialeurodes citrifolii* Morgan, but differs in the presence of dorsal capitate setae and papillae, and in the characters of tracheal pores. Much resembles *Dialeurodes fici* Takah. in being provided with short capitate setae on the dorsum,

but differs in the characters of the tracheal pores, the presence of teeth in the vasiform orifice, possessing more eminent dorsal papillae, and in the larger sculptures scattered in the caudal furrow.

Dialeurodes rarasana n. sp.

(Pupa case) Whitish, with no secretion evident. Elliptic, flattened, thin, about 1.35 times as long as wide, not constricted across the thoracic tracheal pores, not narrowed posteriorly, not indented at the hind end. Mid-thoracic suture not reaching the margin; transverse suture discernible only on the median area; meso- and metanota faintly defined; abdominal segments distinct. Dorsum with numerous small short papillae densely scattered on the submarginal area, which are variable in size, rounded or more or less pointed apically, and directed towards the margin of the case; many long thin faint lines running mesad from the margin; median area with peculiar markings as shown in the figures, and the lateral parts of the median area more or less reticulated; a pair of minute simple setae present on the median area of the anterior part of cephalothorax and also near the base of the vasiform orifice. Margin faintly crenate, with a pair of short usual setae on the anterior and posterior parts. Thoracic tracheal folds not discernible, without dots; the distal pores small, widely opening, wider than long, without teeth. Caudal furrow distinct, very long, narrow, a little widened towards the base, not well defined laterally, about 0.3 mm. long, with many small distinct sculptures on the whole length, which are more or less arranged in transverse rows on the basal part; the distal pore nearly as in the thoracic ones. Vasiform orifice small, rounded, nearly as long as wide, not notched, with some small indistinct teeth; the front margin a little broadened. Operculum wider than long, rounded on the lateral margins, nearly straight on the hind margin, a little narrowed

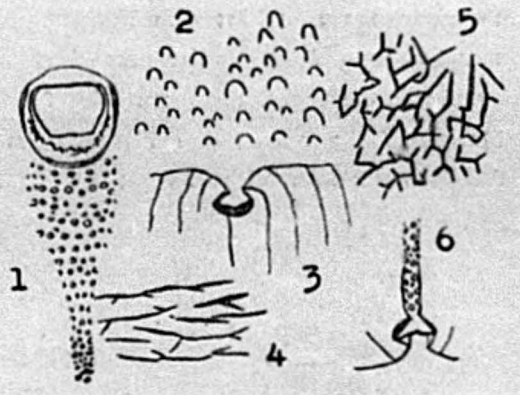

Fig. 26.
Dialeurodes rarasana n. sp.
(Pupa case)
(1) Vasiform orifice and basal part of caudal furrow.
(2) Submarginal papillae.
(3) Thoracic tracheal pore.
(4) Median markings on abdomen.
(5) Median markings on cephalothorax.
(6) Distal part of caudal furrow.

towards the hind margin. Length of pupa case—about 1.85 mm.

Host.—? Lithocarpus sp.

Hab.—Rarasan near Urai.

Some specimens were taken by me on July 31, 1933. Differs from other species of the genus in the characters of the dorsum and in the structures of the thoracic folds and caudal furrow.

Dialeurodes monticola n. sp.

(Pupa case) Whitish, with no secretion evident. Elliptic, flattened, thin, about 1.37 times as long as wide, not narrowed posteriorly, scarcely constricted across the thoracic tracheal folds, not indented at the hind end. Mid-thoracic suture not reaching the margin; transverse suture distinct only on the median part; meso- and metanota faintly defined; abdominal segments distinct. Dorsum lacking distinct papillae, somewhat corrugated on the submarginal area, with many long lines running mesad from the margin; with about 5 pairs of minute simple setae on the submarginal area of the postrior part of abdomen; a pair of very small simple setae present on the cephalothorax; a pair of short simple setae also near the hind end. Margin faintly crenate, with 2 usual pairs of short setae. Thoracic tracheal folds faintly discernible, without dots; the distal ends not forming a pore, but a small distinct shallow cleft present, which is wider than long, with 2 rounded tubercles. Caudal furrow distinct, long, narrow, broadened on the basal part, not thickened on the lateral margins except on the distal small part, about 0.21 mm. long, with many rather large distinct irregular sculptures which are arranged more or less in transverse rows on the basal part, but are absent on the distal small part; the distal end forming a small wide cleft, the basal margin of which is a little trilobed. Vasiform orifice rounded, not notched, with some small indistinct teeth which are hardly discernible in some specimens; the front margin expanded. Operculum much wider than long, rounded on the sides, straight on the hind margin, occupying more than half the orifice. Length of pupa case—about 1.75 mm.

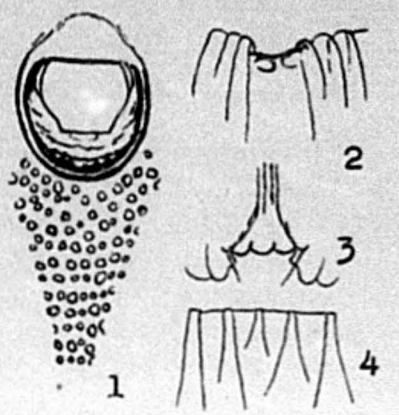

Fig. 27.

Dialeurodes monticola n. sp.

(Pupa case)

(1) Vasiform orifice and basal part of caudal furrow.
(2) Thoracic tracheal cleft.
(3) Distal part of caudal furrow.
(4) Margin.

Host.—Daphniphyllum sp.

Hab.—Rarasan near Urai.

Some specimens were collected by me on July 31, 1933. Related to *Dialeurodes pallida* SINGH, but differs in the characters of the thoracic tracheal and caudal clefts.

Dialeurodes dioscoreae n. sp.

(Pupa case) White, slightly pale yellowish in some specimens, with no secretion. Elliptic, flattened, soft, not constricted across the thoracic tracheal pores, not or scarcely narrowed on the posterior part, broadest about the middle, about 1.3 times as long as wide, not indented at the hind end. Mid-thoracic suture not reaching the margin; transverse suture and abdominal segments discernible only on the median part; thoracic segments faintly discernible. Dorsum with a pair of very small usual setae near the vasiform orifice, and numerous rather large short rounded papillae densely over the surface except on the marginal narrow area and in front of the vasiform orifice, which are conical and more or less pointed apically in some of them, and are not distinct on the median areas of abdominal segments; the 8th abdominal segment chitinized, with many furrow-like markings in front of the vasiform orifice; many short lines running mesad from the margin. Margin crenate; marginal usual 2 pairs of setae normal, short. Thoracic tracheal folds not discernible, the pores very small, just within the margin, closed but not completely, with about 4 short chitinized teeth on the mesal side, which are distinct, rounded apically, nearly as long ae wide, and expanded basally. Caudal furrow distinct, narrow, long, gradually widened anteriorly, at the base nearly as wide as the vasiform orifice, not thickened on the lateral margins, densely with many distinct papilla-like irregular markings on the whole surface, which are much smaller than the dorsal papillae; the distal pore very small, usually not completely closed, as in the thoracic ones, with 4 teeth. Vasiform orifice rather small, wider than long, rounded, not notched, broadest basally, the lateral and hind margins chitinized, with about 8 indistinct teeth, the anterior margin not much expanded. Operculum wider than long, constricted basally, narrowed on the distal part, rounded on the lateral margins of the basal half, truncate on the hind margin, occupying most of the orifice. Length of pupa case—about 1.4–1.5 mm., caudal furrow—about 0.23 mm., width of vasiform orifice—about 0.051 mm. (including the margin),

Host.—Dioscorea rhipogonioides.

Hab.—Taihoku.

Some specimens were collected by me in October 1933. Related to *Dialeurodes formosensis* TAKAH., but differs in the larger dorsal papillae, lacking long dorsal setae, the caudal furrow slender, the structure of the tracheal pores, etc.

Dialeurodes piperis n. sp.

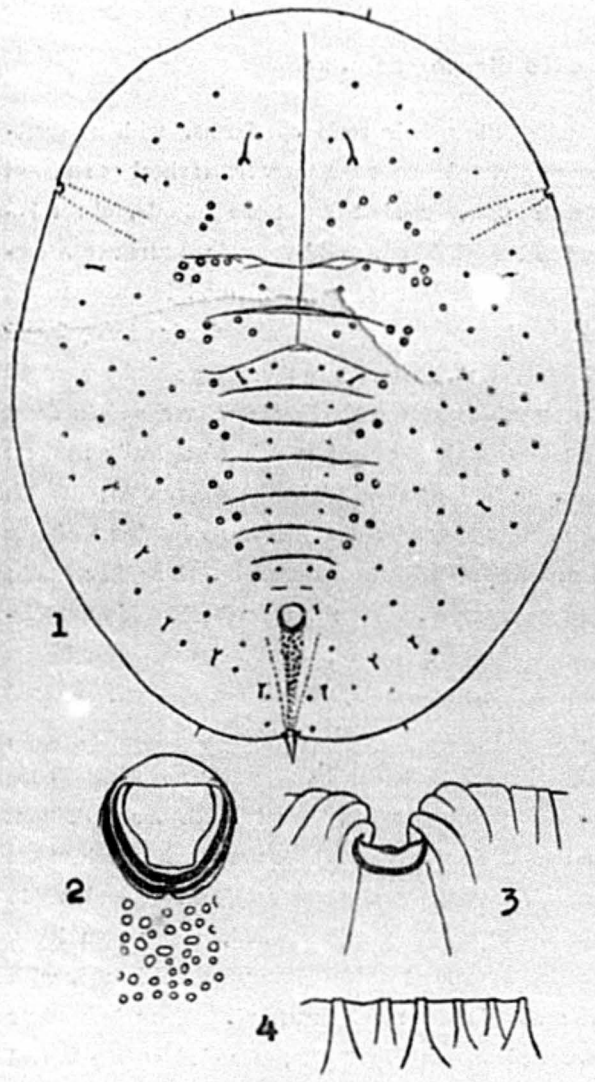

Fig. 28.
Dialeurodes piperis n. sp.
(Pupa case)
(1) Outline. (2) Vasiform orifice and basal part of caudal furrow.
(3) Thoracic tracheal cleft. (4) Margin.

(Pupa case) Dark brown, with no secretion. Elliptic, flattened, thin, slightly indented at the hind end, not constricted across the thoracic tracheal clefts. Mid-thoracic and transverse sutures mot reaching the margin; abdominal segments distinct. Dorsum somewhat corrugated except on the median and marginal areas, with many small circular pores sparsely scattered except on the marginal area, those on the lateral parts of the median area more eminent; cephalothorax with a pair of stout median setae and 1 or 2 pairs of short lateral setae somewhat capitate; abdomen with a pair of short somewhat capitate setae on the 1st segment, a pair of shorter similar setae in front of the vasiform orifice, 5 pairs of short somewhat capitate setae on the submarginal area of the posterior part, and a pair of much longer capitate or simple setae near the hind end; these dorsal setae variable in length. Margin slightly crenate, with markings as shown in the

figure. Thoracic tracheal folds distinct, with no dots and markings; the clefts distinct, widely opening, longer than wide, sometimes with a short rounded tooth. Caudal furrow distinct, narrow, not defined laterally, somewhat widened basally, with many irregular distint sculptures; the distal end nearly as in the thoracic clefts. Vasiform orifice subcordate, lacking teeth, the front margin expanded. Operculum narrowed on the distal part, occupying most of the orifice. Length of pupa case—about 1.9 mm.

Host.—Piper sp.

Hab.—Rarasan near Urai.

Many specimens were taken by me on July 31, 1933. Closely allied to *Dialeurodes pallida* SINGH, but different in the colour and in the dorsal setae capitate. Differs also from *D. fici* TATAH. in the absence of dorsal papillae and in some other characters.

Dialeuropora hassensanensis n. p.

(Pupa case) White. Elliptic, about 1.56 times as long as wide, broadest about the middle, not chitinized, not constricted. Mid-thoracic and transverse sutures not reaching the margin; abdominal segments distinct. Dorsum lacking papillae, but with 28 long very stout simple setae in a single row along the whole margin, 2 pairs of median setae on the cephalothorax, 4 similar pairs on the abdomen, and 5 pairs of large oval or circular simple pores subequal in size; one of the pores wanting on one side in my specimen; the dorsal setae subequal in length, pointed apically, about 0.068 mm. long, those along the margin far reaching beyond it. Margin almost entire. Thoracic tracheal folds and pores not discernible. Caudal furrow not dis-

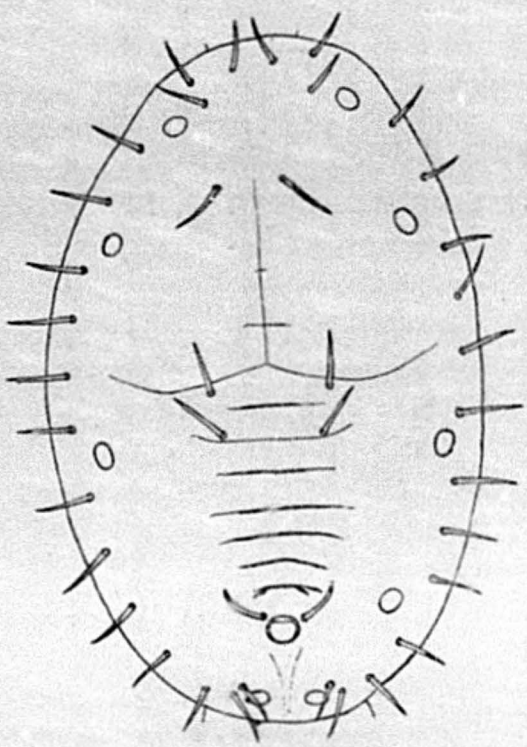

Fig. 29.
Dialeuropora hassensanensis n. sp.
Pupa case

tinct, widened basally, wanting markings. Vasiform orifice subequal in diameter to the large dorsal pores, wider than long, rounded, not notched, without teeth. Operculum wider than long, rounded on the lateral sides, a little narrowed on the posterior part, nearly straight on the hind margin, occupying most of the orifice. Lingula not exposed. Length of pupa case—about 0.92 mm.

Host.—A plant of the Lauraceae.

Hab.—Kahodai (Hassenzan).

A single specimen was collected by me on June 6, 1933. *Dialeuropora* was proposed as a subgenus of *Dialeurodes* by BAKER and QUAINTANCE, but it is characterized by possessing eminent dorsal simple pores and by the thoracic tracheal pores often not discernible, and I elevate it to generic rank. *Dialeuropora hassensanensis* n. sp. is allied to *D. setigera* TAKAH. and *D. decenpuncta* QUAINT. et BAKER, but differs from them in the number, positions and shape of the setae. In this connection it is added that *Dialeuropora brideliae* TAKAH. was found on *Stauntonia* at Hori, Formosa.

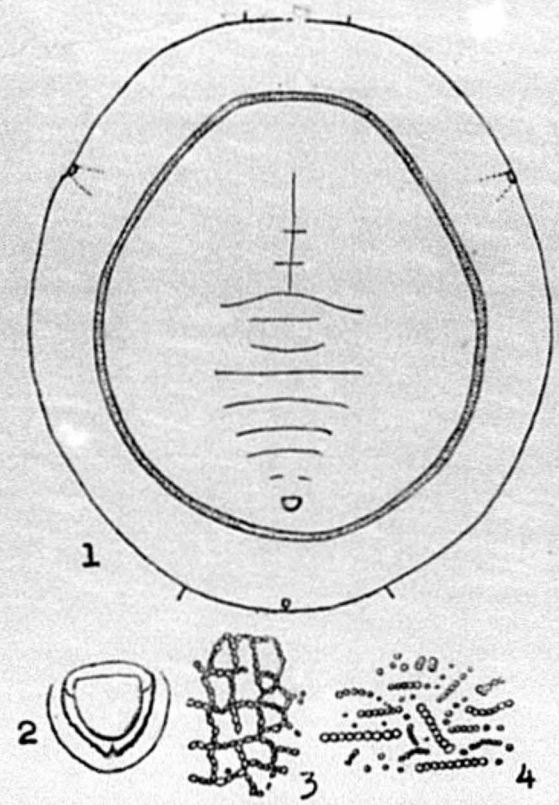

Fig. 30.

Pseudaleurolobus maesae n. sp.
(Pupa case)
(1) Outline. (2) Vasiform orifice.
(3) Reticulations on dorsal disk.
(4) Median markings.

Pseudaleurolobus maesae n. sp.

(Pupa case) Slightly pale brownish, with no secretion evident. Circular, slightly longer than wide, flattened, thin. Mid-thoracic and transverse sutures not reaching the margin of dorsal disk, the latter not turned forewards; abdominal segments discernible on the median area. Submarginal area well defined from the dorsal disk, wide, with many straight narrow furrow-like short markings running mesad from the margin, and some very short setae nearly in a single row which is nearer to the mesal margin than to the margin of the case.

Cephalothorax with no transverse sutures and furrows. Dorsum without papillae and tubercles. Dorsal disk narrowed on the anterior part, narrowly thickened along the margin, reticulated except on the median area, with peculiar irregular markings on the median area; the markings consist of very small circular or oval pores; a pair of short setae present in front of the vasiform orifice. Margin faintly crenate, not chitinized, very thin, with 2 usual pairs of short setae. Thoracic tracheal folds distinct, with numerous minute dots; the pores small, complete, circular, distinctly separated from the margin, chitinized, with about 5 minute indistinct teeth wider than long. Caudal furrow absent. Caudal fold on the venter distinct, widened anteriorly, with numerous minute dots; the distal pore as in the thoracic ones. Vasiform orifice small, much wider than long, broadly rounded on the hind end, much thickened on the lateral margins, not notched, with no teeth distinct. A median short thickened part present between the vasiform orifice and the submarginal area in some specimens. Operculum as long as wide, rounded, nearly filling the orifice. Lingula not visible. Antennae short. Length of pupa case—about 1.1 mm.

Host.—Maesa formosana.

Hab.—Taihokn.

Described from specimens collected by me on January 30, 1933. This species is peculiar in the submarginal area well defined from the dorsal disk and possessing distinct thoracic and caudal tracheal pores, and may be referable to *Pseudaleurolobus* HEMPEL. *Dialeurodes dorsidemarcata* SINGH is also to be included in this genus.

Differs from *D. dorsidemarcata* SINGH in the dorsal disk not produced on the hind end, the tracheal pores closed, and in the absence of polygonal markings behind the vasiform orifice.

Aleurotuberculatus latus n. sp.

(Pupa case) White, with no secretion evident. Broad, a little indented at the hind end. Mid-thoracic and transverse sutures reaching the margin of dorsal disk; abdominal segments distinct. Submarginal area distinct, rather narrow, with markings as shown in the figure. Dorsal disk with many granules except on the central and posterior parts, numerous very thin longitudinal wavy lines on the median area of each segment except on a pair of oval markings, and 3 pairs of rather short capitate setae; a pair of very long stout bristles present at the hind end. Cephalothorax with 3 pairs of markings as shown in the figure, the capitate setae a little longer than those on the abdomen. Marginal teeth very small, short, much

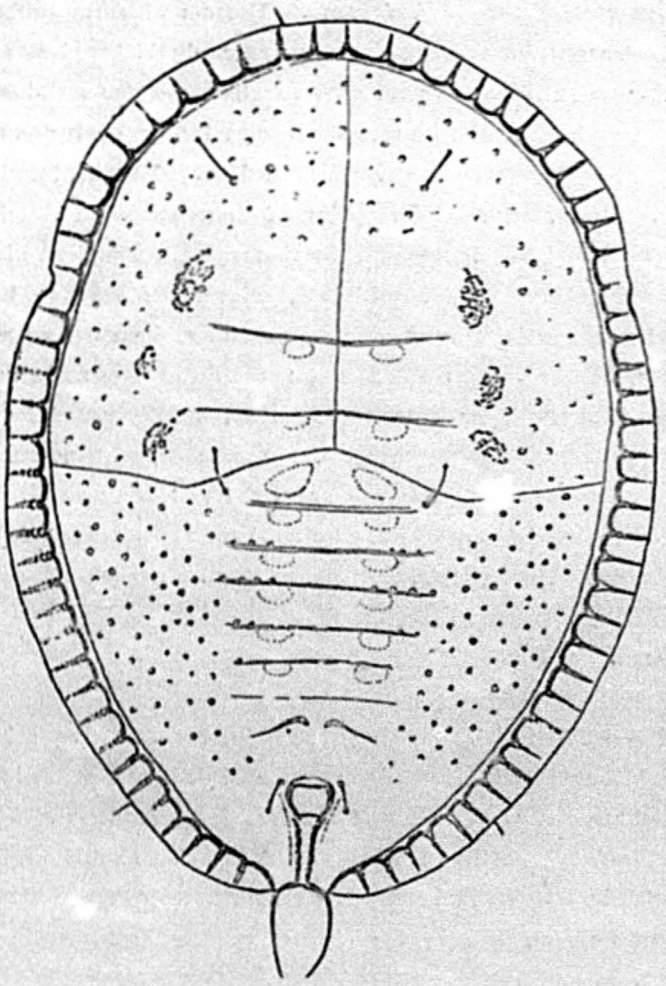

Fig. 31.
Aleurotuberculatus latus n. sp.
Pupa case.

wider than long, rounded; 2 usual pairs of marginal setae short. Thoracic tracheal folds not distinct, the distal ends widely indented a little, not forming pores, without teeth. Caudal furrow distinct, a little expanded basally, slightly narrowed posteriorly, chitinized on the lateral margins, with no markings; the distal end nearly as in the thoracic ones. Vasiform orifice wider than long, widely notched at the hind margin, without teeth. Operculum nearly filling the orifice. Lingula not exposed. Length of pupa case—about 0.7 mm.

Hosts.—Neolitsea acuminatissima, Cinnamomum randaiense.

Hab.—Suisha.

Some specimens were taken by me on June 11, 1933. The dorsal capitate setae are uinque structures in the genus, as far as known to me.

Aleurotuberculatus suishanus n. sp.

(Pupa case) Whitish, somewhat brownish on the median area, with no secretion evident. Very wide, but longer than wide, flattened, slightly constricted in front of the thoracic tracheal pores, a little so near the hind end. Mid-thoracic suture not reaching the margin of dorsal disk; transverse suture a little extending fore-

wards, not reaching the margin; abdominal segments discernible on the median area. Submarginal area distinct, narrow, not well separated from the dorsal disk, with markings as shown in the figure. Dorsal disk not tesselated, with indistinct irrgular corrugation-like markings, and many small papillae arranged in a single row along the margin. Cephalothorax with a pair of very small setae and 3 pairs of very indistinct rounded tubercles; abdomen nearly as long as the cephalothorax, with a pair of very indistinct tubercles on the basal segment and a pair of very short setae in front of the vasiform orifice. Marginal teeth minute, much wider than long, rounded; 2 pairs of usual marginal setae short. Thoracic tracheal folds not discernible, the pores eminent, not completely closed, within the margin, without teeth; a small round area with the margin chitinized present adjacent to each pore. Caudal furrow distinct, rather short, a little expanded basally, slightly narrowed posteriorly, chitinized on the lateral margins, with no markings; the distal pore not completely closed, without teeth. Vasiform orifice rather small, subcordate, thickened on the margin, slightly notched at the hind end, lacking teeth. Operculum much wider than long, narrowed towards the hind end, rounded on the lateral margins, indented on the hind margin, filling most of the orifice. Lingula knobbed, reaching the hind margin of the orifice. Length of pupa case—about 0.51 mm.

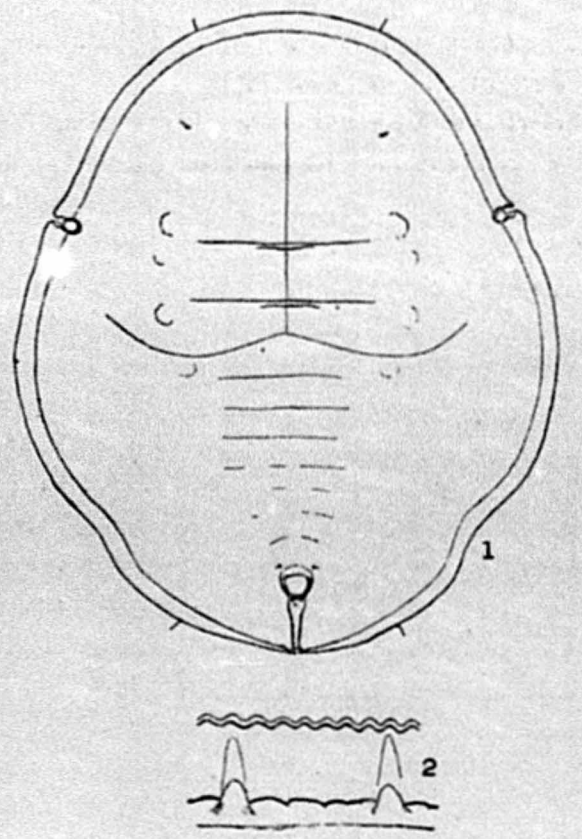

Fig. 32.
Aleurotuberculatus suishanus n. sp.
(Pupa case)
(1) Outline. (2) Submarginal area.

Host.—A plant of the Lauraceae.

Hab.—Suisha.

A few specimens were collected by me on June 11, 1933. This species is very

closely allied to *Aleurotuberculatus minutus* SINGH (*Dialeurodes minuta* SINGH) but differs from the original description in the dorsum not tesselated, the margin with minute teeth, and in the abdomen lacking markings, as well as in the characters of submarginal area.

Aleurotuberculatus lithocarpi n. sp.

(Pupa case) White, slightly dusky at the median part of abdomen, with no secretion evident. Elliptic, indented at the hind end, somewhat chitinized. Mid-thoracic suture not distinct, nearly reaching the margin of dorsal disk; transverse suture not reaching it; abdominal segments distinct. Submarginal area narrow, not well defined, but distinct. Dorsal disk with 4 pairs of large blunt tubercles on the cephalothorax, a pair of smaller similar ones on the basal abdominal segment, many very small granules except on the marginal and median areas, a blunt median tubercle on each of the basal 6 abdominal segments, about 80 distinct rather large papillae in a row along the whole margin, and a pair of long setae near the vasiform orifice and at the hind end; the marginal papillae conical, wider than long, rounded or more or less pointed apically; anterior tubercles on the cephalothorax and basal abdominal tubercles each with a long stout seta at the tip. Marginal teeth very small, triangular, rounded or more or less pointed apically, wider than long; 2 usual pairs of marginal setae rather long. Thoracic tracheal folds not discernible, with no clefts and pores. Caudal furrow distinct, somewhat widened on the base, thickened on the lateral margins, with no distinct markings; the distal end not forming a pore or cleft. Vasiform orifice rather large, wider than long, widely notched on the hind margin, without teeth. Operculum as long as wide, constricted basally,

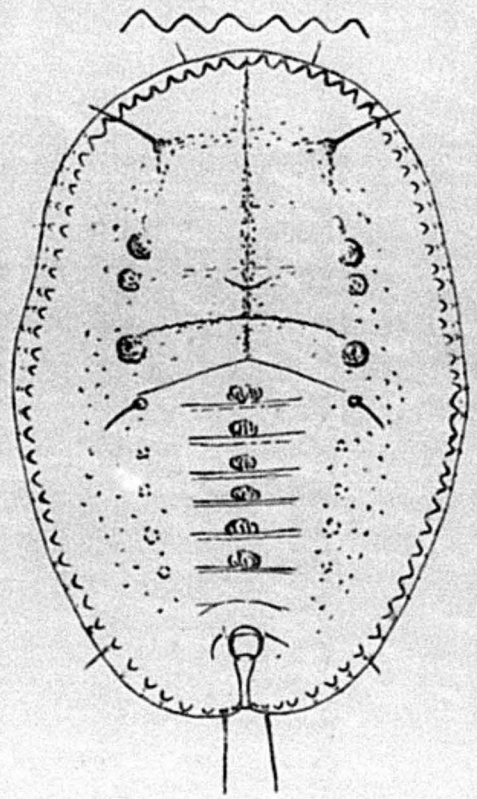

Fig. 33.
Aleurotuberculatus lithocarpi n. sp.
Pupa case and its margin.

tapering on the distal part, rounded apically, nearly filling the orifice. Lingula not exposed. Length of pupa case—about 0.75 mm.

Host.—Lithocarpus uraiana.

Hab.—Suisha, Rirei in Tosei-Gun.

A few specimens were collected by me in June 1933. Related to *Aleurotuberculatus ficicola* TAKAH., but differs in the absence of thoracic tracheal clefts, the presence of eminent papillae on the margin of dorsal disk, and in the anterior margin of vasiform orifice not so expanded, as well as in other characters. Differs from *A. psidii* SINGH also remarkably.

Aleurotuberculatus longispinus n. sp.

(Pupa case) White, with no secretion evident. Elliptic, slightly constricted across the thoracic tracheal folds, flattened, not indented at the hind end. Mid-

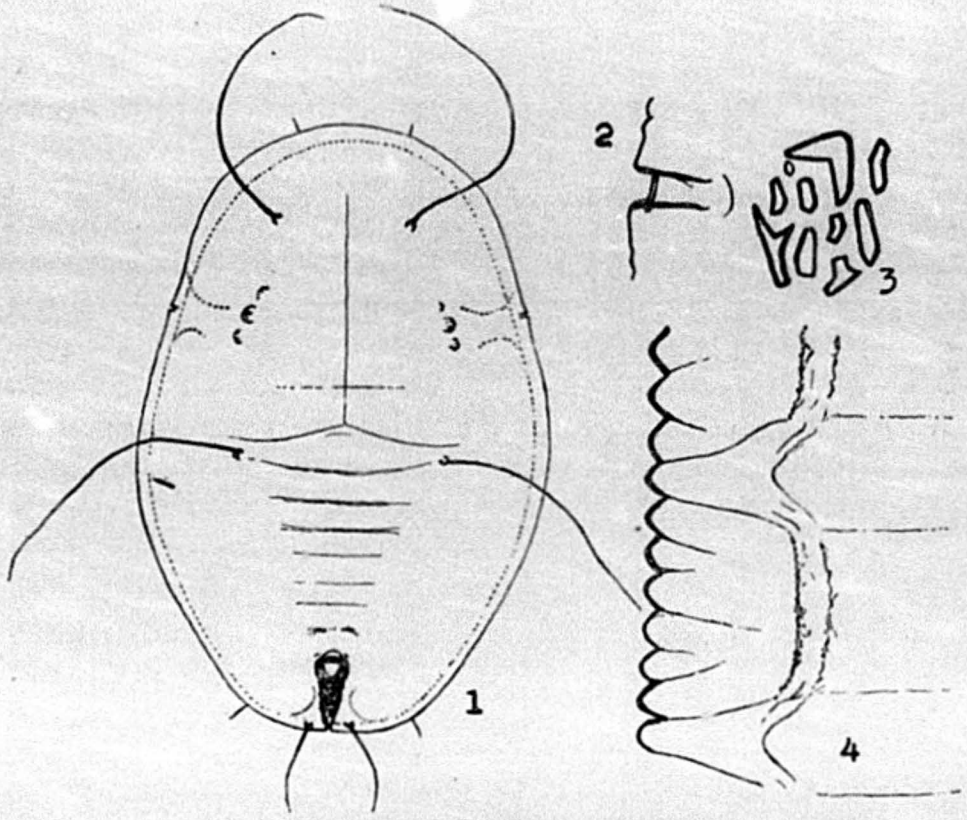

Fig. 34.
Aleurotuberculatus longispinus n. sp.
(Pupa case)
(1) Outline. (2) Thoracic tracheal cleft. (3) Markings on caudal furrow.
(4) Marginal teeth, submarginal area and marginal part of dorsal disk.

thoracic and transverse sutures not reaching the margin of dorsal disk; abdominal segments distinct. Submarginal area not well defined, very narrow, with markings as shown in the figure. Dorsum lacking papillae and granules, but with some small circular pores scattered on the disk, and many indistinct rounded ridges along the margin of the disk. Cephalothorax with a pair of very long thin curved setae and 3 pairs of small obtuse tubercles; basal abdominal segment with a pair of very long curved setae equal in length to the cephalothoracic ones and reaching beyond the margin of case; a pair of much shorter setae also present near the hind end; a pair of very small setae also near the vasiform orifice. Margin chitinized, with 2 pairs of rather long usual setae; the teeth minute, but distinct, much wider than long, rounded apically. Thoracic tracheal folds distinct, very wide, with no markings; the clefts small, distinct, widely opening, wider than long, without teeth. Caudal furrow distinct, wide, widened towards the anterior end, well defined, thickened on the lateral margins, with many distinct rather large irregular markings over the whole surface except on the distal small part; the cleft nearly similar to the thoracic ones, but a little narrowed towards the distal end. Vasiform orifice wider than long, very broadly rounded on the hind margin, scarcely or very slightly notched, lacking teeth, with the anterior margin expanded. Operculum filling most of the orifice. Length of pupa case—about 0.73 mm., caudal furrow including cleft—about 0.06 mm., width of vasiform orifice including margin—about 0.041 mm.

Host.—A shrub not determined.

Hab.—Ikenohata in Rato-Gun.

A single specimen was taken by me on August 1, 1933. This species is different from described species of the genus in possessing very long dorsal setae and in the vasiform orifice scarcely notched.

Aleurotuberculatus melastomae n. sp

(Pupa case) White, with no secretion evident. Elliptic, a little narrowed posteriorly, about 1.5 times as long as wide, soft, not indented at the hind margin. Mid-thoracic suture nearly reaching the margin of dorsal disk; transverse suture not so; abdominal segments distinct. Submarginal area distinct, narrow, nearly vertical, with markings as shown in the figure. Dorsal disk narrowly thickened on the margin; head with a pair of very long thin curved simple setae far reaching beyond the margin; basal abdominal segment with a pair of similar setae; a pair of a little shorter ones present near the hind end; each of these setae arising from a small tubercle; cephalothorax with some very small short rounded papillae

arranged in a row along the hind margin of mesonotum and scattered behind the long setae; abdomen with some similar papillae which are not distinct in some specimens; each abdominal segment with faint longitudinal markings on the median area near the hind margin; a pair of very small setae near the vasiform orifice. Marginal teeth very small, rounded, much wider than long; 2 pairs of usual marginal setae long. Thoracic tracheal folds indistinct; the pores small, opening, wider than long, nearly oval, lacking teeth. Caudal furrow distinct, wide, narrowed on the posterior part, thickened on the lateral margins, scarcely or slightly widened basally, without markings; the distal pore widely opening, larger than the thoracic ones. Vasiform orifice large, wider than long, widely notched on the hind margin, lacking teeth, with the anterior margin much expanded. Operculum wider than long, somewhat narrowed basally, a little narrowed towards the hind end, rounded or straight on the hind margin, occupying most of the orifice. Lingula concealed or a little exposed, a little knobbed, setose. Submarginal area on the venter with markings as shown in the figure. Length of pupa case—about 0.65 mm., caudal furrow —about 0.062 mm.

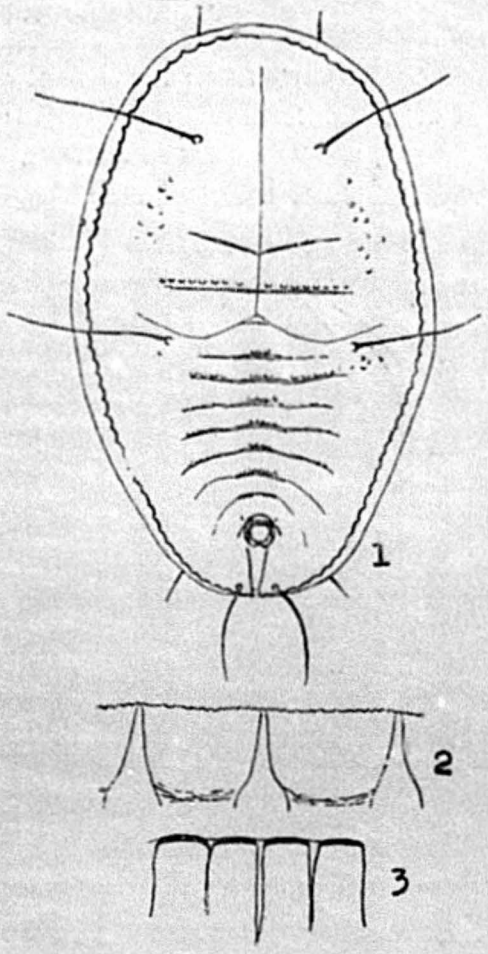

Fig. 35.
Aleurotuberculatus melastomae n. sp.
(Pupa case)
(1) Outline. (2) Submarginal area.
(3) Mesal part of submarginal area of venter.

Host.—Melastoma candidum.

Hab.—Sozan near Taihoku.

Described from specimens collected by me on June 29, 1933. Resembles *A. longispinus* Takah. but differs in the soft pupa case, lacking markings in the caudal furrow, etc. Also resembles *Aleurothrixus indicus* Singh, but distinguished by the presence of tracheal pores and the simple dorsal setae.

Aleurotuberculatus kuwanai n. sp.

(Pupa case) Jet black, with no secretion evident. Oblong, 1.5 times as long as wide, constricted across the thoracic tracheal pores and on the hind half of abdomen, broadly rounded on the front, slightly indented at the hind end, flattened, strongly chitinized. Mid-thoracic suture nearly reaching the margin of dorsal disk; transverse suture not reaching it; abdominal segments distinct. Submarginal area distinct, not well defined, with many fine furrow-like lines running mesad from between the marginal teeth. Dorsal disk with many long fine wavy furrow-like lines running mesad from the margin, many rather small chitinized granules except on the median and marginal areas, some longitudinal wavy fine furrow-like markings on the median parts of the basal 6 abdominal segments, about 4 pairs of large more thickened parts on the cephalothorax, and a pair of rather long setae at the hind end. Marginal teeth very small, rounded, much wider than long; 2 pairs of marginal usual setae short. Thoracic tracheal folds not discernible, the clefts distinct, very small, not closed. Caudal furrow distinct, a little expanded basally, thickened on the lateral margins, without distinct markings; the cleft distinct, not closed, slightly longer than wide, somewhat larger than the thoracic ones. Vasiform orifice subcordate, as long as wide, widely notched at the hind end. Operculum circular, nearly filling the orifice. Length of pupa case—about 0.76 mm.

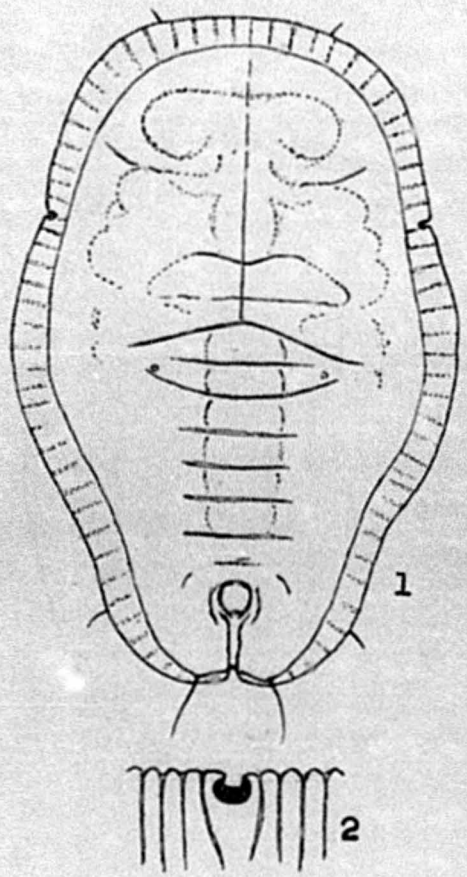

Fig. 36.
Aleurotuberculatus kuwanai n. sp.
(Pupa case)
(1) Outline.
(2) Thoracic tracheal cleft and margin.

Host.—Murraya sp.

Hab.—Suisha.

A single specimen was taken by me on June 11, 1933. Closely allied to

Aleurotuberculatus murrayae SINGH, but differs in the shape of pupa case and in the vasiform orifice more widely notched. Named after the late Dr. I. KUWANA, who much contributed to the study of the Japanese Aleyrodidae.

Aleurotuberculatus murrayae SINGH.

Aleurotrachelus murrayae, SINGH, Mem. Dept. Agr. Ind., Ent. Ser., XII, p. 62 (1931).

Host.—Helicia formosana.

Hab.—Suisha.

Two specimens were collected by me on June 11, 1933. Previously known from India.

Aleurotuberculatus neolitseae n. sp.

(Pupa case) Black, with no secretion evident. Elliptic, flattened, chitinized, not indented at the hind end, lacking dorsal tubercles, but with many eminent papillae distributed on the dorsum as shown in the figure, which are short, chitinized, and mostly rounded apically, but some are pointed. Mid-thoracic and transverse sutures reaching the margin of dorsal disk; abdominal segments distinct. Dorsal disk very slightly constricted on the cephalothorax, with some long straight furrow-like lines running mesad from the margin, and some longitudinal linear thickenings on the thorax. Submarginal area well defined, rather narrow. Margin not toothed, with a pair of long fine setae at the hind end and 2 pairs of short usual setae. Thoracic tracheal folds distinct, reach-

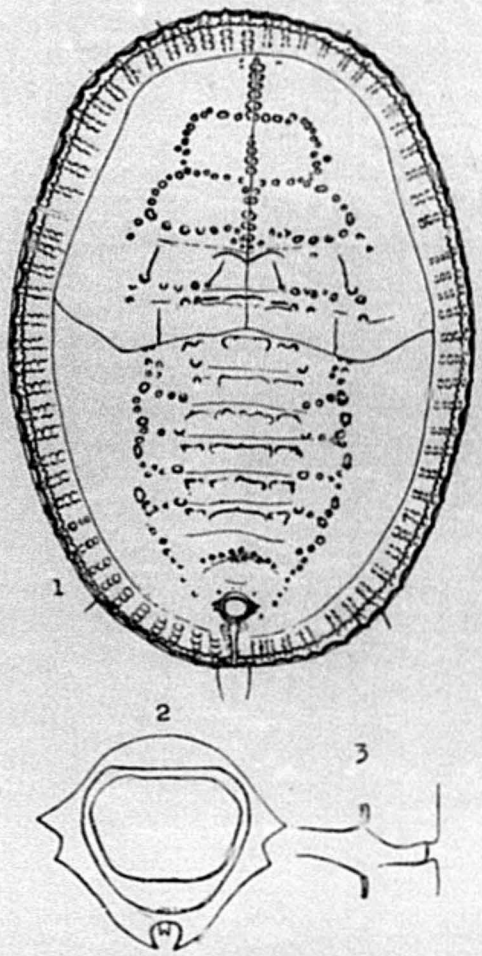

Fig. 37.
Aleurotuberculatus neolitseae n. sp.
(Pupa case)
(1) Outline. (2) Vasiform orifice.
(3) Thoracic tracheal cleft.

ing the dorsal disk, lacking dots and markings; the clefts widely opening, wider than long, very small, without teeth. Caudal furrow distinct, chitinized on the lateral margins, widened on the basal part, with no markings; the distal end not forming a pore nor cleft. Vasiform orifice moderate in size, wider than long, thickened on the margin, deeply notched at the hind end, lacking teeth, with 2 eminent pointed tubercles on each lateral margin, and a very small tubercle pointed apically and divided in the posterior notch. Operculum wider than long, occupying most of the orifice. Lingula not exposed. Length of pupa case—about 0.7 mm.

Host.—Neolitsea acuminatissima.

Hab.—Suisha.

Some specimens were collected by me on June 11, 1933. Differs remarkably from other members of the genus in the peculiar vasiform orifice with lateral tubercles and in the distribution of dorsal spillae.

Aleurotuberculatus thysanospermi n. sp.

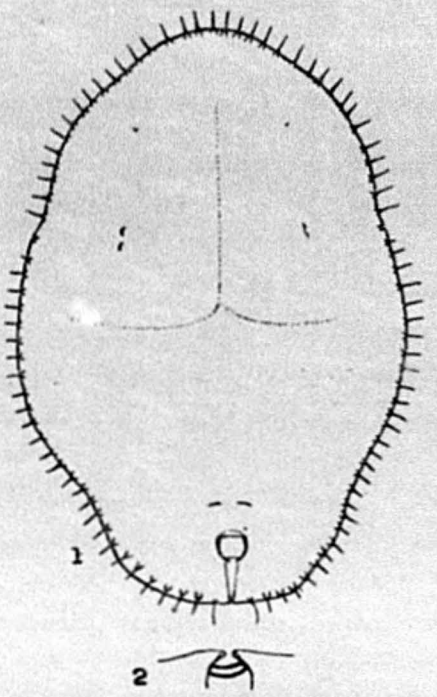

Fig. 38.
Aleurotuberculatus thysanospermi n. sp.
(Pupa case)
(1) Outline (abdominal segments not shown).
(2) Thoracic tracheal pore.

(Pupa case) White, with no secretion evident. Elliptic, somewhat constricted across the thoracic tracheal folds and a little so on the posterior part of abdomen, not indented at the hind end, flattened. Mid-thoracic suture not reaching the margin, transverse suture not strongly curved, not reaching the margin; thoracic segments not discernible; abdominal segments can not be observed in my incomplete specimen. Submarginal area not defined, with many long stout setae arranged in a single row along the margin of case, which are straight or a little curved, pointed apically, much expanded on the basal part, and subequal in length, but a seta behind each thoracic tracheal pore much shorter. Dorsum with many rather short narrow furrow-like markings running mesad from the margin and similar but longer irregular markings on the median area; cephalothorax with a pair of small setae and 2 pairs of indistinct

small tubercles on the madian area; abdomen with a pair of small usual setae in front of the vasiform orifice and a pair of long fine hairs near the hind end. Margin thickened, with minute rounded very short teeth not distinct, and a posterior pair of short usual setae. Thoracic tracheal folds not distinct, the pores small, not completely closed, wider than long, without teeth. Caudal furrow distinct, broadened anteriorly, a little thickened on tne lateral margins, with no distinct markings; the pore nearly as in the thoracic ones. Vasiform orifice rather large, wider than long, distinctly notched widely on the hind margin, lacking teeth. Operculum rounded, nearly as long as wide, occupying most of the orifice. Length of pupa case—about 0.55 mm., submarginal seta—about 0.024 mm., caudal furrow—about 0.042 mm. (including pore).

Host.—Thysanospermum diffisum.

Hab.—Ikenohata in Rato-Gun.

A single specimen was collected by me on August 1, 1933. This species is characterized by the eminent setae along the margin. Not a typical species of the genus. Resembles *Dialeurodes filamentosa* Corbett recently described from Malaya, but differs considerably in many characters.

Since my material of this species consists of but a single broken pupa case, in a number of respects this description must be incomplete, but neverthless many characters have been carefully worked out and it has been thought best to publish the species at this time rather than to await the discovery of more material of this rare form.

Aleurotuberculatus lagerstroemiae n. sp.

(Pupa case) White, with no secretion evident. Elliptic, somewhat narrowed on the posterior part, flattened, thin. Mid-thoracic suture faint, nearly reaching the margin; cephalothorax without transverse sutures; transverse suture not reaching the margin; abdominal segments discernible on the median area. Dorsum lacking papillae and tubercles, with a pair of rather short setae near the hind end, which are crossed. Submarginal area not defined. Margin with many minute rather shallow teeth rounded and much wider than long; 2 pairs of usual marginal setae short. Thoracic tracheal folds very wide, with no distinct markings; the clefts large, entirely opening, much wider than long, widely chitinized on the margin, lacking teeth. Caudal furrow distinct, expanded basally, not chitinized on the lateral margins, without markings; the cleft a little smaller than the thoracic ones, not thickened on the margin, a little rounded, but widely opening, without teeth. Vasiform orifice subcordate, much wider than long, thickened on the lateral

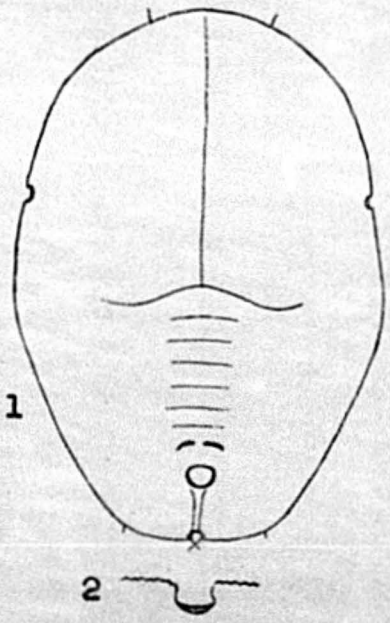

Fig. 39.
Aleurotuberculatus lagerstroemiae n. sp.
(Pupa case)
(1) Outline.
(2) Thoracic tracheal cleft.

margins, nearly straight and scarcely notched on the hind margin. Operculum as long as wide, a little constricted basally, nearly filling the orifice. Lingula not exposed. Length of pupa case—about 0.77 mm., width of thoracic tracheal cleft—about 0.016 mm.

Host.—Lagerstroemia indica.

Hab.—Shinten near Taihoku.

Two specimens were taken by me on December 25, 1932. This species is not a typical form of the genus and is closely rela . to *A. malloti* Takah., but differs in the following characters: (1) Dorsum lacking papillae, long setae, and tubercles. (2) Thoracic tracheal folds discernible, with the clefts narrower. (3) Dorsal setae near the hind end shorter. (4) Vasiform orifice scarcely notched.

Tuberaleyrodes bobuae n. sp.

(Pupa case) White, with no secretion evident. Elliptic, thin, flattened. Mid-thoracic and transverse sutures not reaching the margin; abdominal segments distinct. Submarginal area with many long wavy lines running mesad from the margin. Dorsal disk corrugated on the abdomen, chitinized in front of the vasiform orifice, with some very small circular pores scattered, many short eminent papillae as shown in the figure, and 22 short blunt tubercles, each of which is provided with a short capitate seta; the tubercles on the median area of cephalothorax and basal abdominal segment a little larger and the last pair on the abdomen smaller, while the remaining subequal in size. Marginal teeth minute, wider than long, very short, rounded; 2 pairs of usual marginal setae short. Thoracic tracheal folds not discernible, the pores small, not completely closed, just within the margin, lacking teeth. Caudal furrow not distinct, widened anteriorly, without markings, the pore small, closed. Vasiform orifice rather small, rounded, a little notched at the hind end, without teeth. Operculum nearly as long as wide, narrowed on the posterior

part, rounded on the sides of basal half, nearly straight on the hind margin, occupying most of the orifice. Lingula not exposed. Length of pupa case—about 1.75 mm.

Host.—Bobua glauca.

Hab.—Suisha.

A few specimens were taken by me on June 11, 1933. This species is allied to *Tuberaleyrodes machili* TAKAH., but differs in the distribution and smaller size of dorsal tubercles, as well as in the presence of many eminent dorsal papillae.

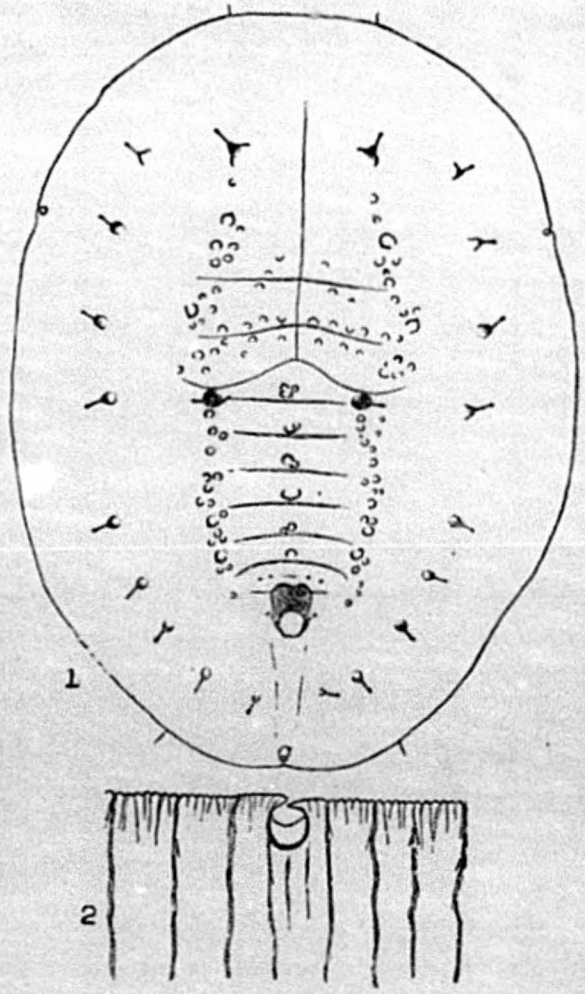

Fig. 40.
Tuberaleyrodes bobuae n. sp.
(Pupa case)
(1) Outline.
(2) Thoracic tracheal pore and submarginal area.

Pealius polygoni n. sp.

(Pupa case) White or slightly pale yellowish, with no secretion eminent. Elliptic, flattened, not constricted across the thoracic tracheal folds, lacking ridges and tubercles, not indented at the hind end, with a pair of long very stout setae at the hind end, which are sometimes short. Mid-thoracic suture nearly reaching the margin; transverse suture not so; abdominal segments distinct on the median area. Dorsum lacking papillae, but with some very small circular pores; submarginal area with many small irregular indistinct shallow concaves; cephalothorax and basal abdominal segment with a pair of long very stout setae not reaching the margin; a pair of similar setae also present near the vasiform orifice, which are sometimes very short; abdominal segments 1–6 each with a pair of markings near the anterior margin. Margin chitinized; the teeth

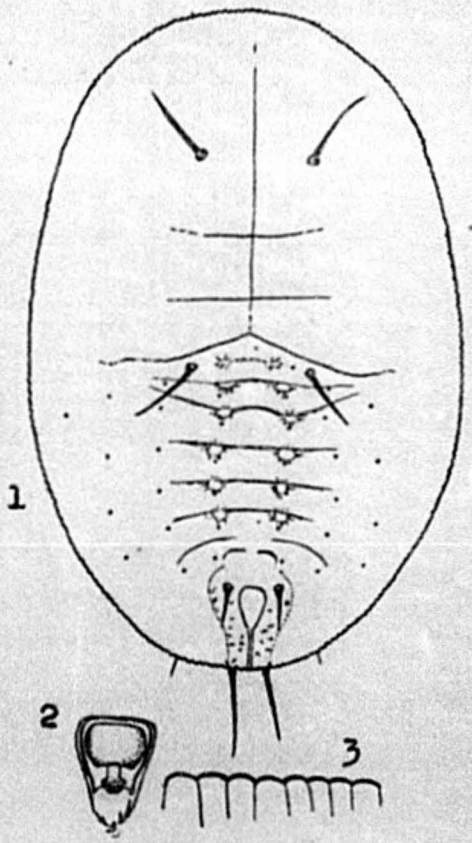

Fig. 41.
Pealius polygoni n. sp.
(Pupa case)
(1) Outline.
(2) Vasiform orifice and pit.
(3) Margin.

very short, small, broadly rounded, much wider than long; anterior usual marginal setae often not discernible, very short; the posterior ones longer. Thoracic tracheal folds and clefts or pores not discernible. Caudal furrow distinct, narrow, without markings distinct. Lobes surrounding the vasiform orifice not eminent, reaching the margin, somewhat granular. Vasiform orifice tapering, a little indented widely on the hind margin, somewhat thickened on the lateral margins, nearly as long as wide, lacking teeth, in a distinct pit. Pit nearly triangular, rounded or more or less pointed at the hind end, much longer than wide, lacking distinct markings, much longer than the vasiform orifice, but a little shorter than the caudal furrow. Operculum wider than long, rounded on the lateral margins, widely indented on the hind margin, occupying more than half the orifice. Lingula knobbed, setose, reaching a little beyond or not the hind margin of the orifice, without long setae. Antennae short. Length of pupa case—about 1.0 mm.

Host.—Polygonum sp.

Hab.—Taihoku.

Many specimens were taken by me on December 5, 1932. Differs from other species of the genus in the characters of the pit, in which the vasiform orifice is located.

Bemisia kuwanai n. sp.

(Pupa case) Whitish, with a very narrow secretion along the margin. Elliptic, somewhat chitinized, a little notched at the anterior end, a little indented at the

hind end, somewhat constricted at the hind part of cephalothorax and across the thoracic tracheal folds. Mid-thoracic and transverse sutures reaching the margin; abdominal segments distinct, the 2nd and 3rd segments eminently defined on the median part. Dorsum lacking papillae, indistinctly reticulated except on the median area, with 30 setae in a single row along the whole margin, each of which arises from a small tubercle (the setae are broken in my specimen); meso- and metanota and basal 6 abdominal segments each with a pair of markings on the anterior part. Marginal teeth small, very short, broadly rounded, much wider than long; anterior pair of marginal usual setae short, the posterior ones not discernible in my specimen. Thorac tracheal folds distinct, without markings, the distal end with a small protuberance on the margin. Caudal furrow distinct, reaching the margin, narrowed posteriorly, thickened on the lateral margins of basal half, not well defined on the posterior half, with many large distinct sculptures; the distal end with about 5 very small rounded teeth. Vasiform orifice a little wider than long, tapering, very thin and straight on the hind margin, lacking teeth. Operculum wider than long, a little constricted basally, rounded apically, filling nearly half the orifice. Lingula large, eminently knobbed, reaching far beyond the hind margin of the orifice, somewhat constricted on the knobbed part near its base, more or less pointed apically, with a pair of long apical setae. Length of pupa case—about 0.8 mm.

Host.—Ficus sp.

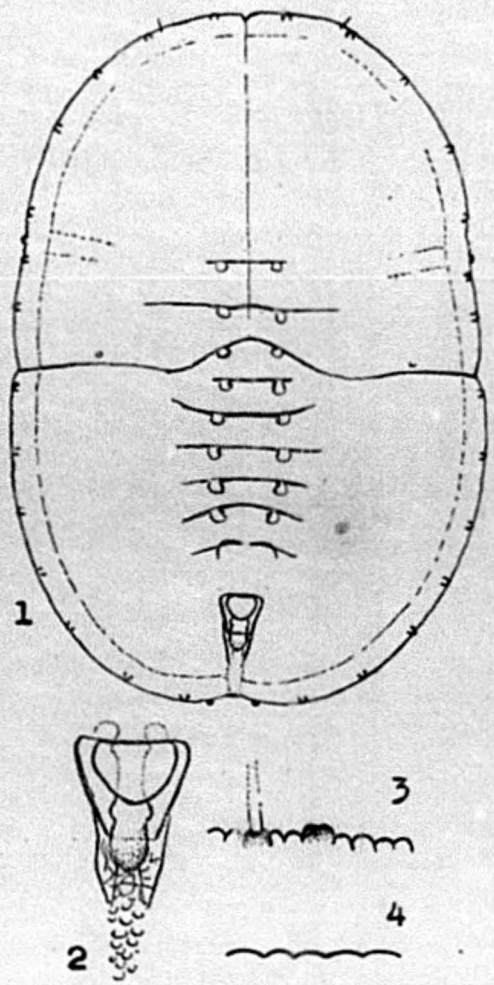

Fig. 42.
Bemisia kuwanai n. sp.
(Pupa case)
(1) Outline (marginal setae broken).
(2) Vasiform orifice and caudal furrow.
(3) Margin of thoracic tracheal fold and a seat (broken). (4) Margin.

Hab.—Rirei near Kurasu in Tosei-Gun.

A single specimen was collected by me on June 5, 1933. This species is closely allied to *Bemisia myricae* KUWANA, but differs in the number of marginal setae, the marginal teeth broader, the caudal furrow sculptured, the lingula different in shape, etc.

Named in the memory of the late Dr. I. KUWANA who did valuable pioneer works in the study of the Aleyrodidae of Japan.

Aleurolobus rhododendri n. sp.

(Pupa case) Black, becoming dark or blackish brown when treated with potash, with no secretion evident. Elliptic, flattened, slightly indented at the hind end, chitinized. Mid-thoracic and transverse sutures reaching the margin of dorsal disk; abdominal segments distinct. Eye spots distinct. Submarginal area well defined except on the posterior small part, not very wide, with many distinct narrow mark-

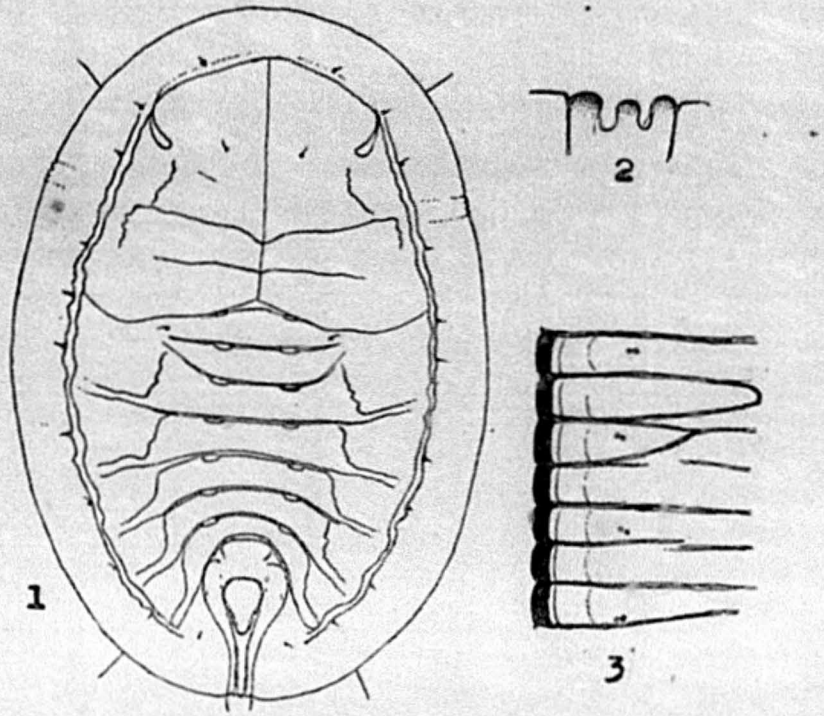

Fig. 43.

Aleurolobus rhododendri n. sp.

(Pupa case)

(1) Outline. (2) Thoracic tracheal combs. (3) Submarginal area.

ings running mesad from the margin and reaching the basal margin, many minute paired pores in a row, and 22 very short fine setae in a row on the whole basal margin. Dorsal disk corrugated in some specimens, with a pair of very short setae on the head and on the basal abdominal segment, and some minute paired pores; each abdominal segment with a pair of small oval markings on the anterior part. Marginal teeth very short, wide, straight or broadly rounded on the distal margin; 2 pairs of usual marginal setae long; a pair of shorter stouter setae present at the hind end. Thoracic tracheal folds faintly discernible, the combs with 3 teeth which are distinct, narrower than other marginal teeth, rounded apically, not reaching beyond the margin, and similar to the caudal combs. Vasiform orifice triangular, rounded at the hind end, much longer than wide, lacking distinct teeth, surrounded by an usual lobed area reaching the margin. Caudal furrow narrow, a little longer than the vasiform orifice, with irregular polygonal sculptures discernible on the posterior part in some specimens. Operculum triangular, longer than wide, rounded apically, almost filling the orifice. Lingula concealed, but a pair of long apical setae exposed. Length of pupa case—about 1.15 mm.

Host.—Rhododendron sp.

Hab.—Sozan near Taihoku.

Common on a Rhododendron transplanted from Japan. Described from specimens taken by me on July 3 and September 23, 1933. This species is allied to *Aleurolobus setigerus* Quaint. et Baker, differing in the positions and number of shorter submarginal setae, as well as in other characters of submarginal area.

Aleurothrixus smilaceti n. sp.

(Pupa case) Pale greenish when alive, dusky longitudinally on the median area except at the middle, with white cottony secretions on the marginal and lateral submarginal areas. Ovate, a little narrowed on the anterior part, with a median ridge on the cephalothorax. Mid-thoracic suture eminent, not reaching the margin; suture between the meso- and metanota eminent; transverse suture not reaching the margin, produced anteriorly on the median part, but not reaching the mesonotum; posterior abdominal segments more distinctly defined. Dorsum lacking papillae, but with a few minute circular pores which are wanting near the margin; cephalothorax with a pair of rather short median simple setae, and 2 much shorter submarginal setae on each side; the 2nd and 3rd abdominal segments each with a pair of long very stout capitate setae which are slightly or scarcely curved, a little broadened towards the base, equal in length, not reaching the margin,

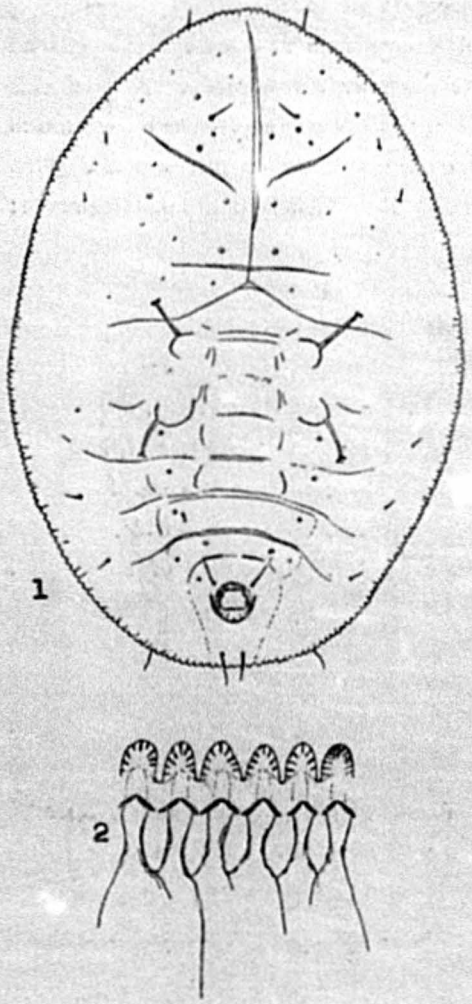

Fig. 44.
Aleurothrixus smilaceti n. sp.
(Pupa case)
(1) Outline.
(2) Marginal teeth and submarginal area.

and each arising from a rather large tubercle; the 4th, 5th and 6th abdominal segments with a very short simple submarginal seta on each side; a pair of rather long stout simple setae present in front of the vasiform orifice and also near the posterior extremity. Marginal teeth rather large, in 2 rows; the outer teeth nearly as long as wide, nearly triangular or broadly rounded apically, with some narrow markings running mesad from their margins, (see the figure) which are not distinct in some specimens; the inner teeth very short, more or less pointed apically, much wider than long, chitinized on the distal margin; 2 pairs of marginal usual setae short. Thoracic and caudal furrows and clefts not discernible. Vasiform orifice rather large, a little elevated, a little longer than wide, subcordate, rounded, with about 11 slender teeth, thickened on the lateral margins. Operculum much longer than wide, straight or a little indented on the hind margin, constricted basally, occupying more than half the orifice, with minute setae on the hind margin. Lingula a little exposed, a little knobbed, setose, with a pair of long apical setae. Length of pupa case—about 0.9 mm.

Host.—Smilax sp.

Hab.—Hichiseisan near Taihoku.

Many specimens were collected by me on September 23, 1933. Related to *Aleurothrixus antidesmae* TAKAH., but remarkably differs in the fewer aud smaller dorsal pores not arranged in row along the margin, as well as in the structures of the median dorsal setae on the abdomen.

Setaleyrodes quercicola n. sp.

(Pupa case) Whitish, with no secretion evident. Elongate, nearly twice as long as wide, flattened, a little chitinized, slightly but widely indented at the hind end. Dorsum with many short rather large chtinized papillae, some which are conical and pointed apically; 26 long stout setae somewhat curved arranged in a row along the whole margin, 3 pairs of similar setae on the cephalothorax and a pair of similar ones on the basal abdominal segment; these setae subequal in length, each arising from a small tnbercle; a pair of very short setae present near the vasiform orifice. Margin with no distinct teeth, with 2 pairs of short usual setae, and a pair of long stout setae at the hind end, which are a little curved, nearly as long as the submarginal setae and each arising from a distinct chitinized tubercle. Abdominal segments distinct except on the posterior part, each with a pair of markings on the anterior part; cephalothorax with 6 pairs of nearly similar markings on the median area. Thoracic tracheal folds and pores not discernible. Caudal furrow eminent, wide, narrowed posteriorly, reaching nearly the anterior margin of vasiform orifice, chitinized on the lateral margins, with eminent irregular markings; the distal end not forming a pore, with no teeth. Vasiform orifice somewhat longer than wide, widely and very shallowly indented on the hind margin, lacking teeth. Operculum wider than

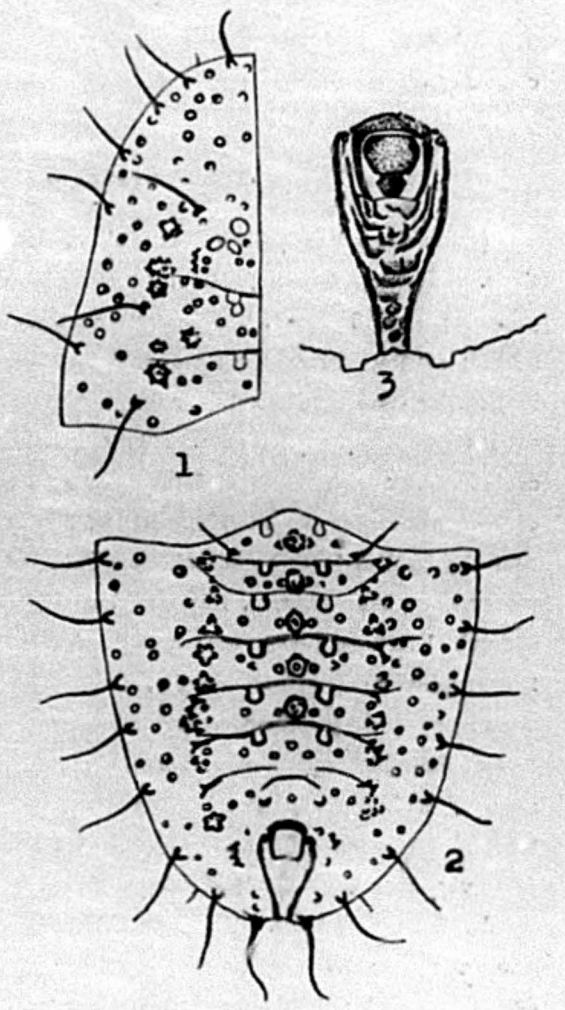

Fig. 45.

Setaleyrodes quercicola n. sp.

(Pupa case)

(1) Cephalothorax (left half).
(2) Abdomen.
(3) Caudal furrow and vasiform orifice.

long, straight on the hind margin, rounded on the sides, filling half the orifice. Lingula knobbed, reaching the hind margin of the orifice. Venter with a narrow marginal rim. Length of pupa case—about 0.9 mm.

Host.—Quercus variabilis.

Hab.—Kurasu, Kahodai (Tosei-Gun).

Four broken discarded skins were collected by me on June 6 and 7, 1933. Not a typical form of the genus. Differs from *Setaleyrodes mirabilis* TAKAH. in possessing many dorsal papillae and submarginal setae, as well as in many other characters.

Tetraleurodes oplismeni n. sp.

(Pupa case) Pale yellow when alive, densely covered with white cottony secretions. Elliptic, elongate, about twice as long as wide, somewhat narrowed on the posterior part, flattened. Mid-thoracic suture not distinct, reaching the submarginal suture; suture between the meso- and metanota eminent, slightly or scarcely curved, long; transverse suture not reaching the margin of dorsal disk; abdominal segments distinct on the median area. Dorsum without papillae and pores on the disk; cephalothorax with 2 pairs of long setae on the median area; abdomen with a pair of long setae near the vasiform orifice, and a pair of long, but more slender, setae near the hind end; these dorsal setae subequal in length, but those on the cephalothorax sometimes shorter, the anterior 3 pairs not reaching the margin; basal 7 abdominal segments each with a pair of small faint markings on the anterior part. Submarginal area rather narrow, well defined except on the posterior small part, with many small semilunate transparent areas in a single row near the whole margin. Dorsal disk with many short transparent furrow-like lines running mesad from the margin, which are absent on the posterior part. Eye spots absent. Thoracic tracheal folds and caudal furrow not discernible. Margin more chitinized, with the teeth very small, rounded, short, and wider than long, and the posterior pair of usual setae rather long. Vasiform orifice large, rounded, somewhat narrowed posteriorly, nearly as long as wide, a little protruding, not notched, without teeth. Operculum wider thah long, filling about two-thirds of the orifice. Lingula knobbed, reaching to or a little beyond the hind margin of the orifice, setose, with a pair of rather long apical setae. Venter with numerous small circular pores on the posterior part. Antennae not long, without an apical process. Length of pupa case—about 0.85 mm., width of vasiform orifice—about 0.055 mm.

(Adult male) Antennae 6-jointed; the 2nd joint very large, much longer than

wide, narrowed towards the base; the 3rd the longest, narrowed on the basal and middle parts; the 6th tapering; the relative length of joints about as follows: I—5, II—11, III—26, IV—11, V—5, VI—9; sensoria not discernible.

Host.—Oplismenus sp.

Hab.—Shinten, Urai, Hori.

Very common, occurring in abundance. Closely allied to *Tetraleurodes semilunaris* CORBETT, but differs in the characters of the submarginal area.

Tetraleurodes graminis n. sp.

(Pupa case) Black, with white wax on the whole margin. Elongate, about twice as long as wide, chitinized. Cephalothorax with a shallow median ridge nearly reaching the margin, and a straight distinct suture between the meso- and metanota not reaching the margin of dorsal disk; transverse suture reaching the submarginal suture, turned forwards on the lateral parts; abdominal segments distinct on the median area. Submarginal area rather wide, well defined except on the posterior part, slightly so on the anterior part, with many lines except on the posterior part, some very small circular pores, and some irregular transverse linear thickenings behind the vasiform orifice; the mesal parts of lateral submarginal areas more chitinized, with many transverse parallel lines. Dorsal disk with a few minute pores, a pair of shallow concaves on the anterior part of each abdominal segment, many rather large indistinct granule-like markings on the lateral narrow areas, and a pair of very short setae near the vasiform orifice. Eye spots wanting. Margin crenate, with the posterior pair of usual setae rather long. Thoracic tracheal folds and caudal furrow not discernible. Vasiform orifice rather large, subcordate, rounded broadly on the hind margin, not notched, nearly as long as wide, protruding, lacking teeth. Operculum filling the orifice. Lingula concealed, knobbed, setose. Length of pupa case—about 1.0 mm., width of submarginal area—about 0.09 mm.

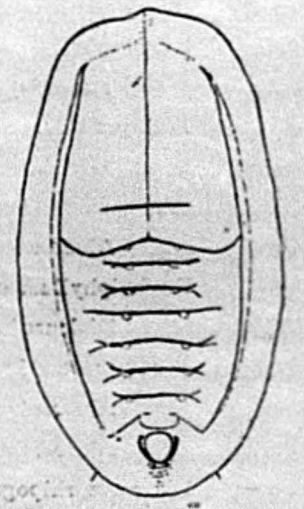

Fig. 46.
Tetraleurodes graminis n. sp.
(Pupa case)

Host.—A plant of the Gramineae (Imperata ?).

Hab.—Shinten near Taihoku.

A few specimens were collected by me on February 5, 1933. Distinguished from other species in the elongate pupa case.

Aleurocanthus mangiferae QUAINT. et BAKER.

Proc. U.S. Nat. Mus., LI, p. 345 (1917); SINGH, Mem. Dept. Agr. India, Ent. Ser., XII. p. 69 (1931).

Host.—Lithocarpus uraiana.

Hab.—Suisha.

Some pupa cases were found by me on June 11, 1933. New to the fauna of Formosa. This species is easily recognized by the knobbed marginal teeth of pupa case. On no occasion was this whitefly found on mango in Formosa.

New food-plants of the Formosan Aleyrodidae.

Adinandra sp. (Camelliaceae).

Dialeurodes fici TAKAH.

Bobua glauca (Symplocaceae).

Tuberaleyrodes bobuae TAKAH.

Boehmeria frutescens (Urticaceae).

Bemisia achyranthes SINGH.

Cinnamomum randaiense (Lauraceae).

Aleurotuberculatus latus TAKAH.

Daphniphyllum sp. (Euphorbiaceae).

Dialeurodes monticola TAKAH.

Decaspermum fruticosum (Myrtaceae).

Aleuroplatus pectiniferus QUAINT. ef BAKER.

Aleurotuberculatus gordoniae TAKAH.

Dioscorea rhipogonioides (Dioscoreaceae).

Dialeurodes dioscoreae TAKAH.

Eriobotrya japonica (Rosaceae).

Aleurocanthus spiniferus QUAINT.

Eurya acuminata (Camelliaceae).

Dialeurodes bladhiae TAKAH.

Ficus sp. (Moraceae).

Bemisia kuwanai TAKAH.

Gossypium sp. (Malvaceae)

Bemisia hibisci TAKAH.

Hedera formosana (Araliaceae).

Dialeurodes citri ASHM.

Helicia formosana (Proteaceae).

Aleurotuberculatus murrayae SINGH.

Gramineae (a plant of the) (Imperata ?)

Tetraleurodes graminis TAKAH.

Lagerstroemia indica (Lythraceae).

Aleurotuberculatus lagerstroemiae, TAKAH.

Lauraceae (a plant of the).

Aleurotuberculatus suishanus TAKAH.

Lithocarpus sp. (Fagaceae).

Dialeurodes citri ASHM.

D. bladhiae TAKAH.

Lithocarpus uraiana.

Aleurocanthus mangiferae QUAINT. et BAKER.

Aleurotuberculatus lithocarpi TAKAH.

Maesa formosana (Myrsinaceae).

Pseudaleurolobus maesae TAKAH.

Melastoma candidum (Melastomataceae).

Aleurotuberculatus melastomae TAKAH.

Murraya sp. (Rutaceae).

Aleurotuberculatus kuwanai TAKAH.

Neolitsea acuminatissima (Lauraceae).

Aleurotuberculatus latus TAKAH.

A. neolitseae TAKAH.

Oplismenus sp. (Gramineae).

Tetraleurodes oplismeni TAKAH.

Piper sp. (Piperaceae).

Dialeurodes piperis TAKAH.

Polygonum sp. (Polygonaceae).

Fealius polygoni TAKAH.

Quercus variabilis (Fagaceae).

Setaleyrodes quercicola TAKAH.

Rhododendron sp. (Ericaceae).

Aleurolobus rhododendri TAKAH.

Smilax sp. (Liliaceae).

Aleurothrixus smilaceti TAKAH.

Stauntonia sp. (Lardizabalaceae).

Dialeuropora brideliae TAKAH.

Tetrastigma umbellata (Vitaceae).

Dialeurodes tetrastigmae TAKAH.

Thysanospermum diffisum (Rubiaceae).

Aleurotuberculatus thysanospermi TAKAH.

Vrena lobata (Malvaceae).

Aleuroplatus pectiniferus QUAINT. et BAKER.

Viburnum sp. (Caprifoliaceae).

Dialeurodes formosensis TAKAH.

Vigna sp. (Leguminosae).

Bemisia hibisci TAKAH.

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